



Non-Linear Scriptwriting

A Graph-Based Authoring Tool for Interactive Scenarios

Developing Interactive Narrative Content Seminar 2004

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NOMADS LAB
NONLINEAR MEDIA:
ART, DEVELOPMENT AND SCIENCE

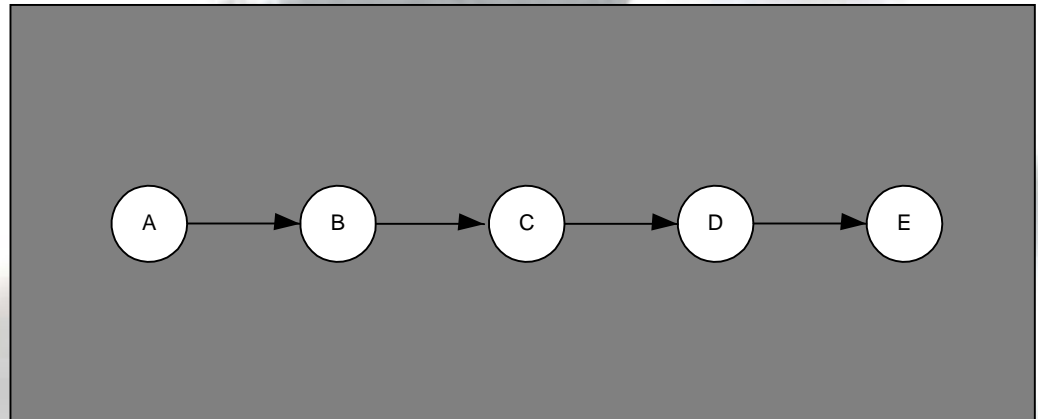
Overview

- Non-Linearity
- Authors and Content Production
- Learning from the movie industry?
- Non-Linear Script & Storyboard – aVRed Authoring Tool
- Graph structures
- Conclusion
- First applications

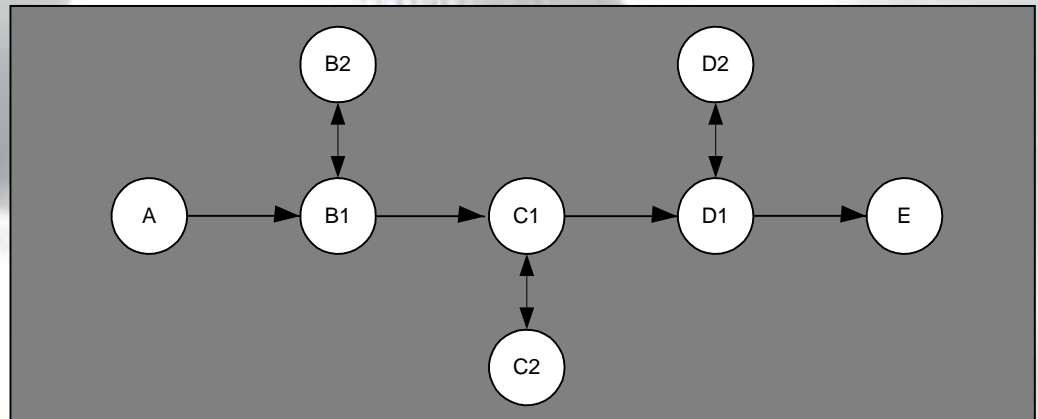
Non-Linearity

Non-Linear?

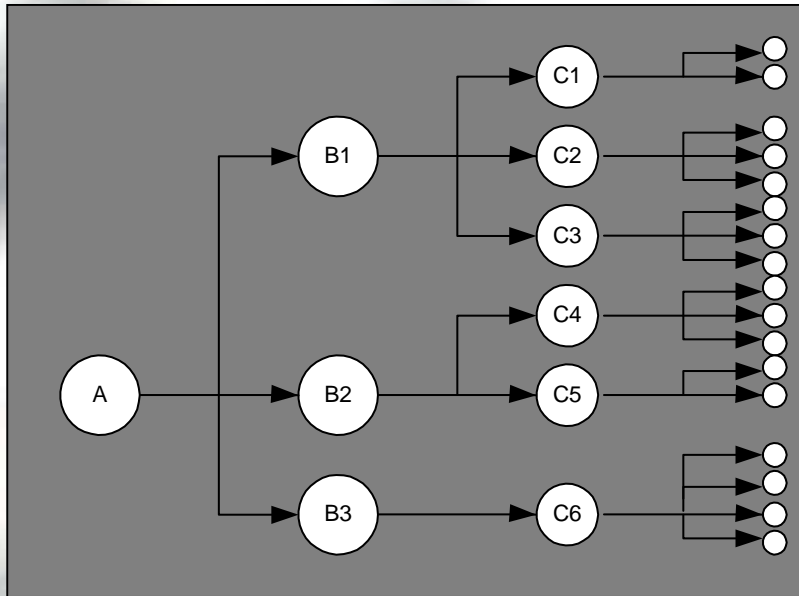
Linear Structure
(e.g. Movies)



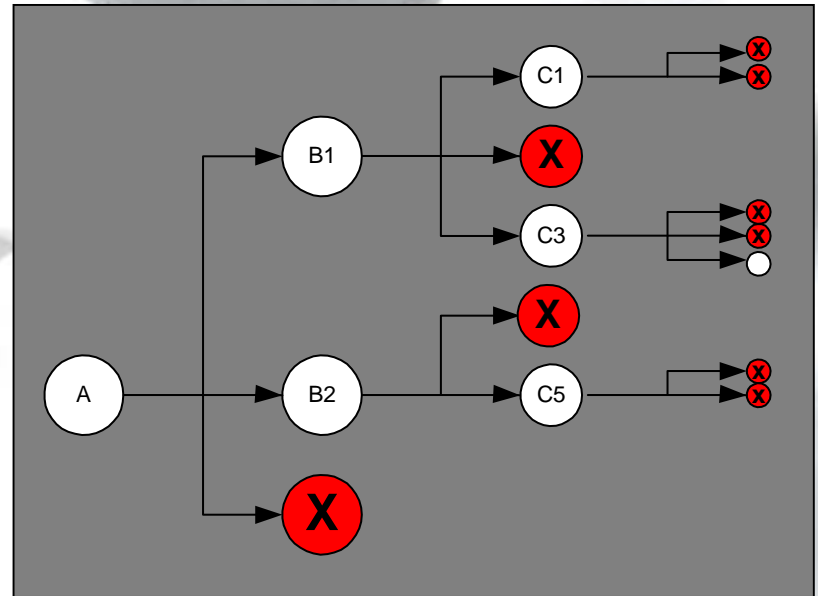
Cul-de-sacs



Non-Linearity



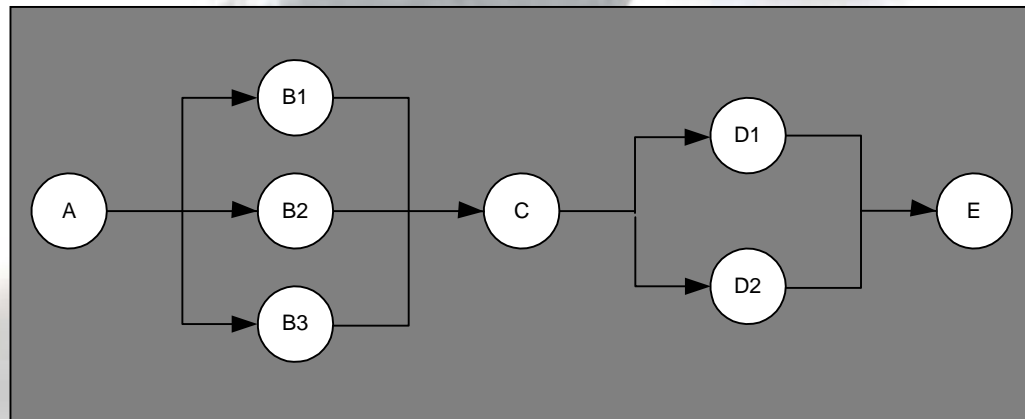
Branching



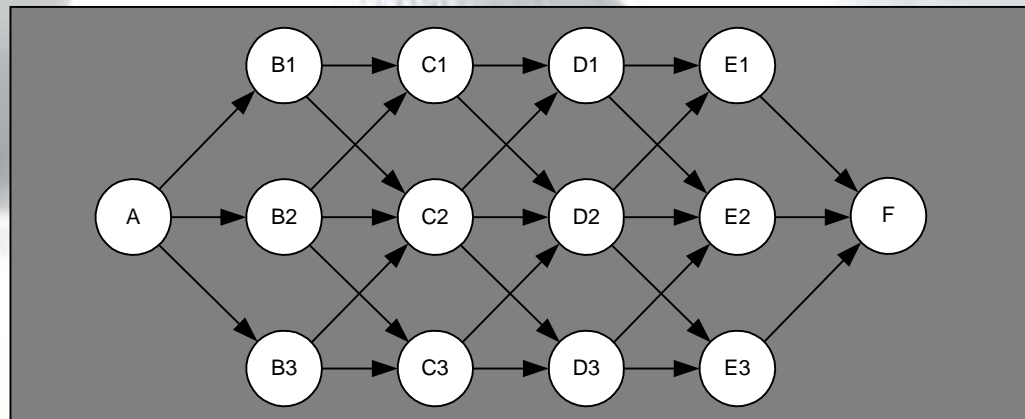
Branching with forced path

Non-Linearity

Branching with
Foldback



Parallel Streaming
(e.g. i-TV)



Content Production: Current Situation

Most of the scenarios are

- of a highly *linear* nature (i.e. movies) or lack dramaturgic progress
- created from scratch
- created by programmers not by authors and artists

Software tools for authors and artists do NOT

- focus on story / scenario modeling
- deliver suitable output for story / game / VR engines

Content Production: Current Situation

Comparison with the movie industry:

' Movies did not flourish until engineers lost control to artists.'

P. Heckel

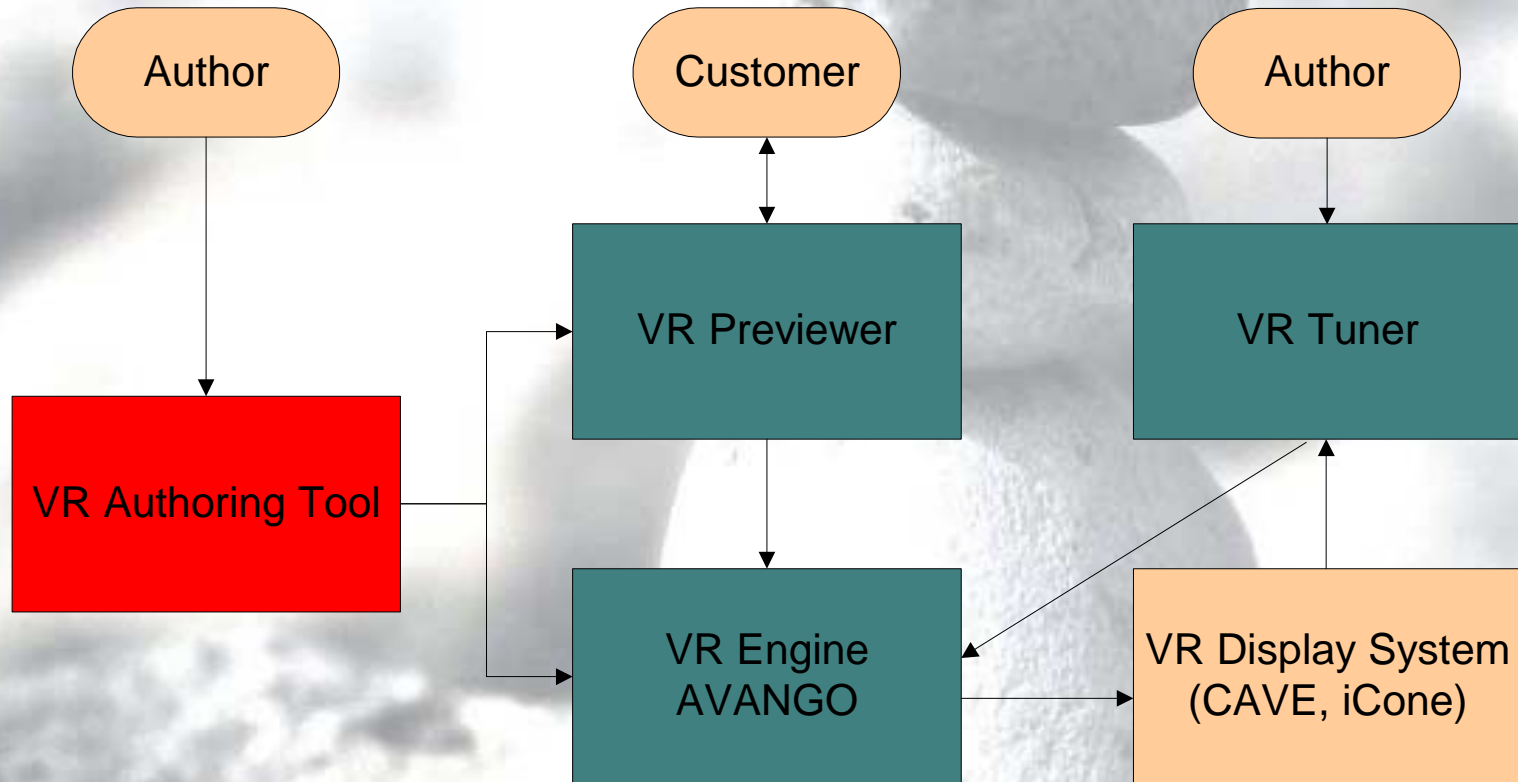
The aVRRed Project

Objectives:

Knowledge, Tools and Methods
for the creation of non-linear content for VR environments

(CAVE, iCONE, VR / Story / Game Engines)

aVRRed™ Tools



Partners

LMR Laboratory for Mixed Realities

LMR

FhG-IMK Institute for Media Communication



facts+fiction



rmh - new media



Vertigo Systems

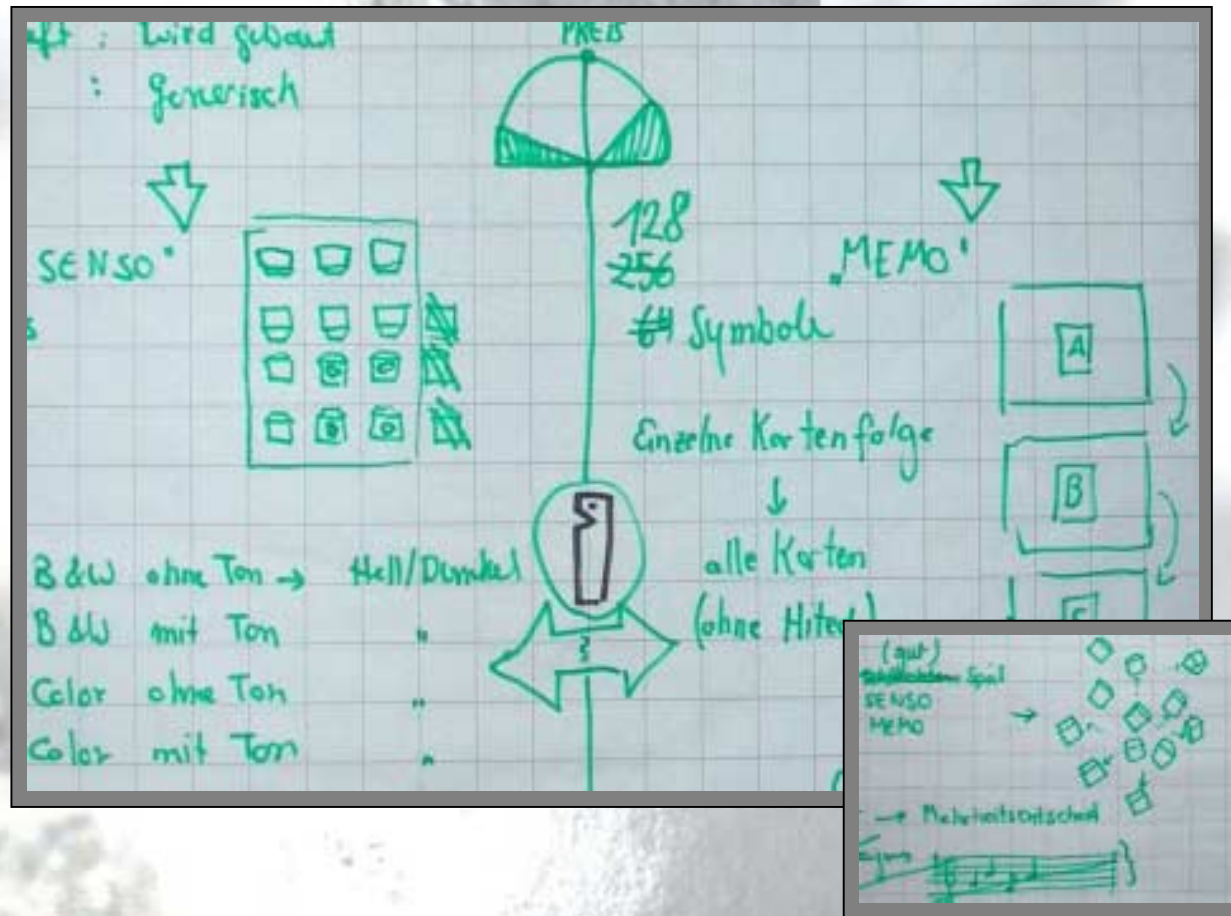


Supported by the Ministry of Research and Education (BMBF)

Production of Non-Linear Content

1. The Idea

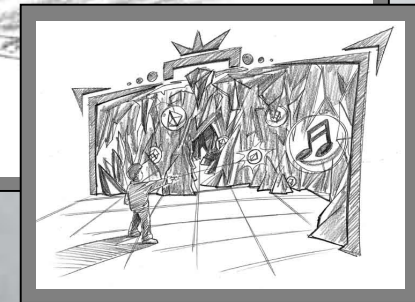
(Scribbles)



Production of Non-Linear Content

2. Story Outline

(1-4 pages text,
some drawings)



Production of Non-Linear Content

3. ?

Movie productions as model?

Movie production:

- Idea
- Story Outline
- Script
- Storyboard
- Filming
- Editing

VR production:

- Idea
- Story Outline
- ? } **AUTHORING GAP**
- ? }
- 3D modeling
- Editing (only cutscenes)
- Scripting

Non-Linear Scriptwriting

Problems for Authors:

- Need for non-linear scriptwriters not seen in the industry (e.g. computer games)
⇒ Created by programmers
- Authors are no programmers (usually)
- Authoring tools for non-linear scriptwriting do not exist

Non-Linear Scriptwriting

An 'appropriate' scriptwriting tool should offer

- Non-linear scenario modeling
- Non-linear storyboarding
- More?

Non-Linear Script & Storyboard

Observation:

Everybody writes down flow charts (e.g. with Visio)

complicated! But:

- \approx plot progress chart
- intuitive structure
- rigid mathematical structure (i.e. *directed graph*)

Non-Linear Script & Storyboard

The aVRRed VR Authoring Tool uses

- directed
- hierarchical
- parallel

graphs.

Non-Linear Script & Storyboard

Directed graphs:

- ideal for modeling of processes
 - easy to grasp
 - unambiguous structure
- ⇒ suitable as direct input for VR / story / game engines

Non-Linear Script & Storyboard

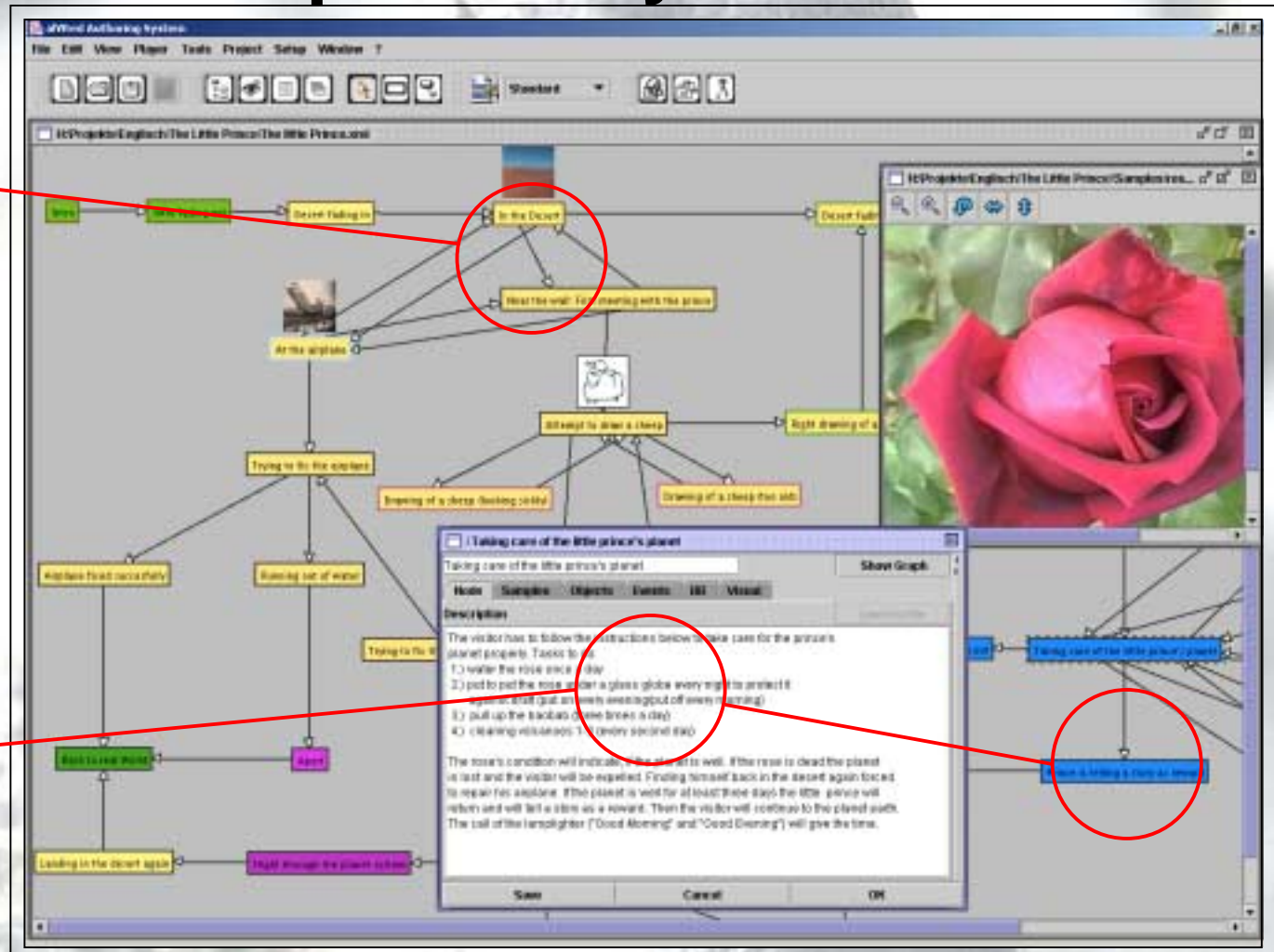
Entire scenario is

- broken down into small story relevant states (*Storygraph*)
- modeled as a net of state transitions

Non-Linear Script & Storyboard

Non-Linear Storygraph

Node Description: Scenery, Progress



Non-Linear Script & Storyboard

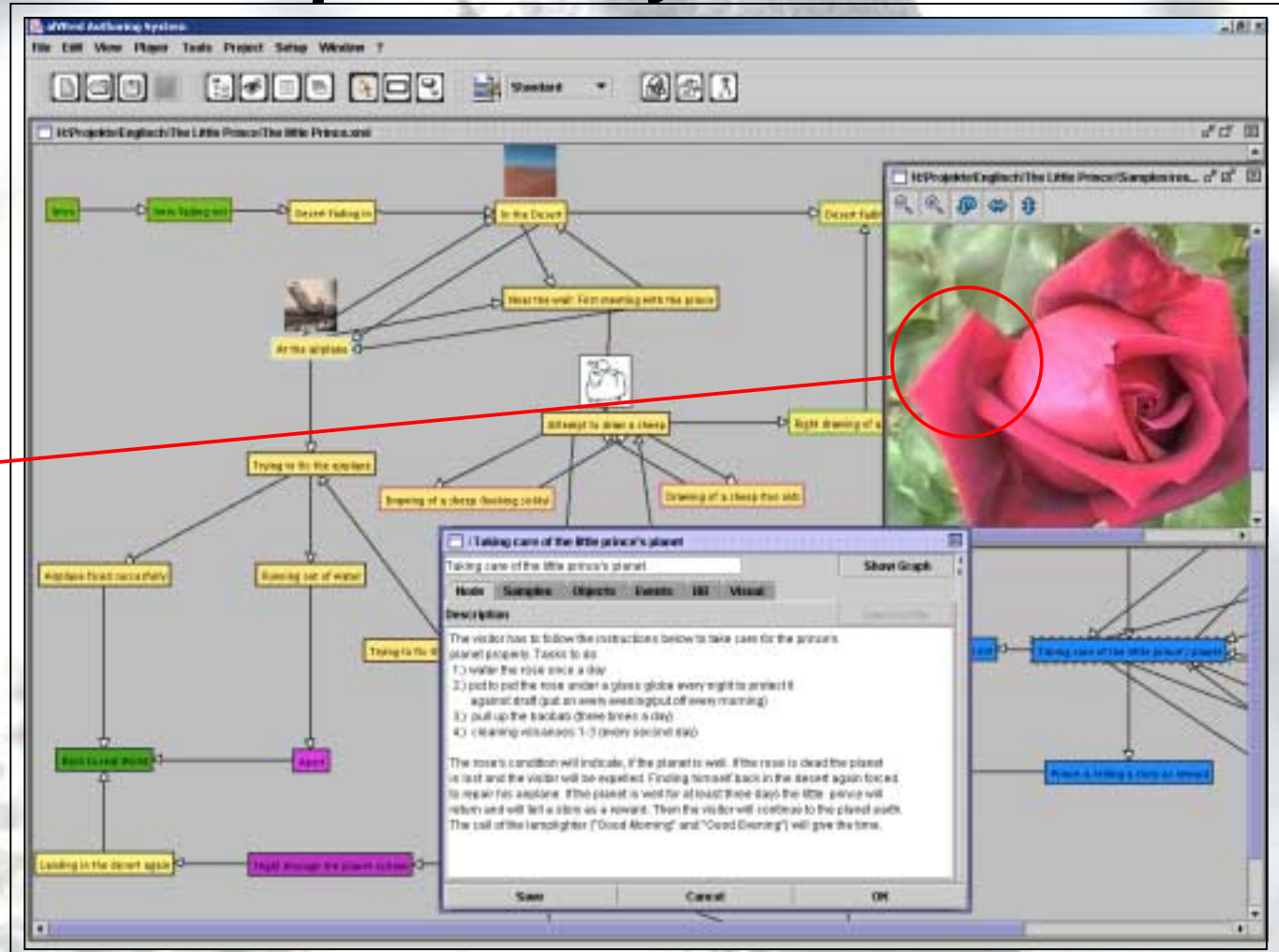
Nodes represent particular situations:

- scene
- camera shot
- attributes of the environment

Connectors (arrows) represent transitions

- by user interaction
- self-triggered (e.g. timeout, logical)

Non-Linear Script & Storyboard



Media Player for Attached Samples

Non-Linear Script & Storyboard

Nodes contain:

- Description text
- Sample files (pictures, sounds, movies,..)

Non-Linear Script & Storyboard

Scenario progress along the storygraph

Nodes determine the possible *states* of the story

State of the story = active node

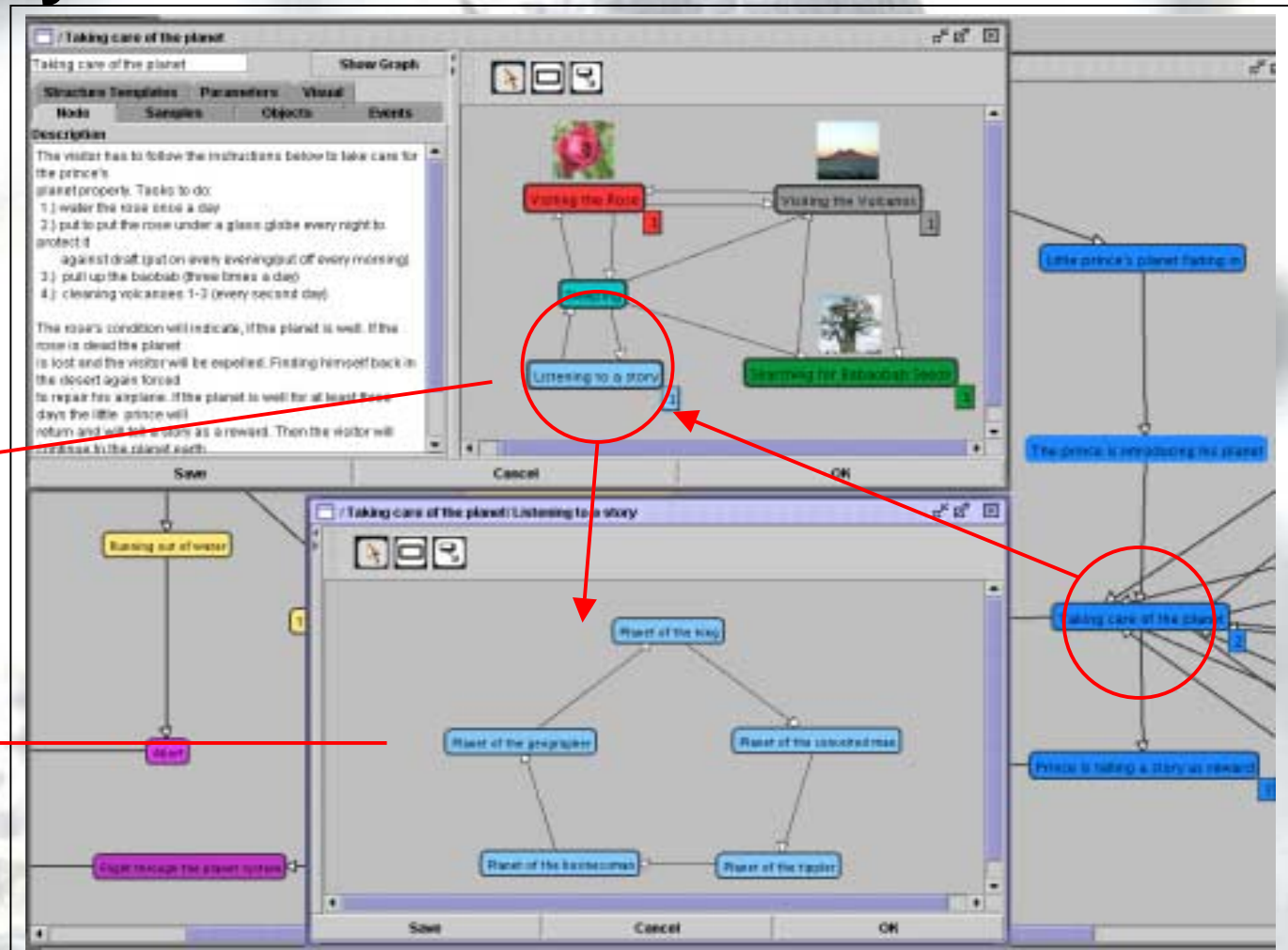
Hierarchy

The aVRRed VR Authoring Tool uses *hierarchical* graphs.

Hierarchy

- ideal for organizing huge structures
- encapsulation of (sub)structures

Hierarchy



Subgraph

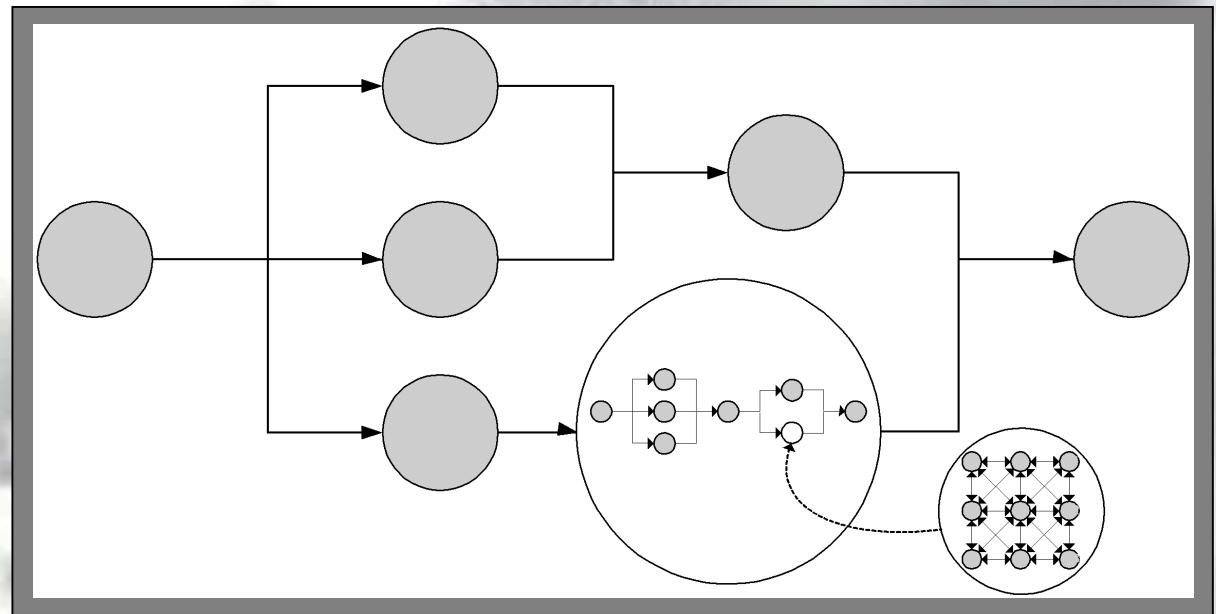
Sub-Subgraph

Hierarchy

Fully recursive structure

'Infinite' depth
of nodes

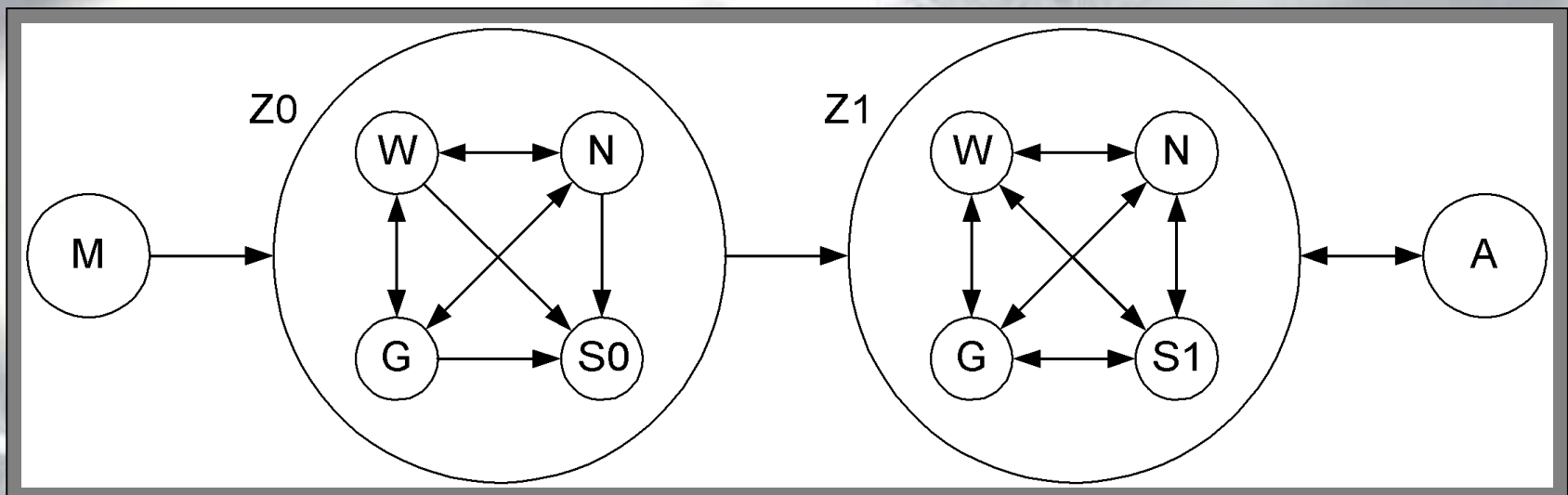
Possibility of
inheritance



Hierarchy

Still complicated:

The author has to model too many scenario states explicitly

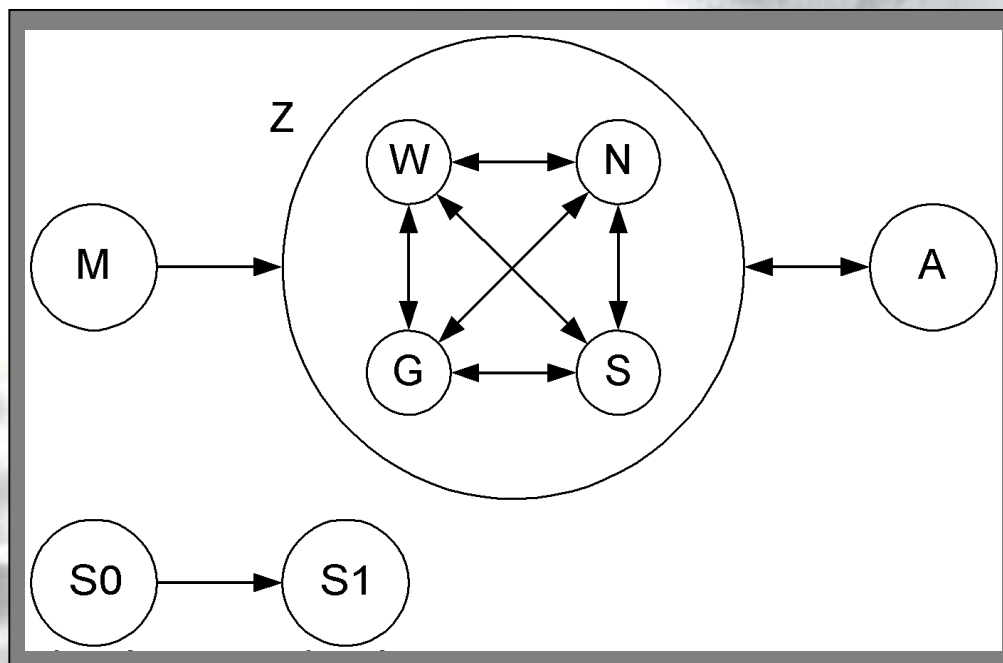


Z0: Player does NOT possess key

Z1: Player DOES possess key

Parallelization

The aVRRed VR Authoring Tool uses *parallel* graphs.



Parallelization

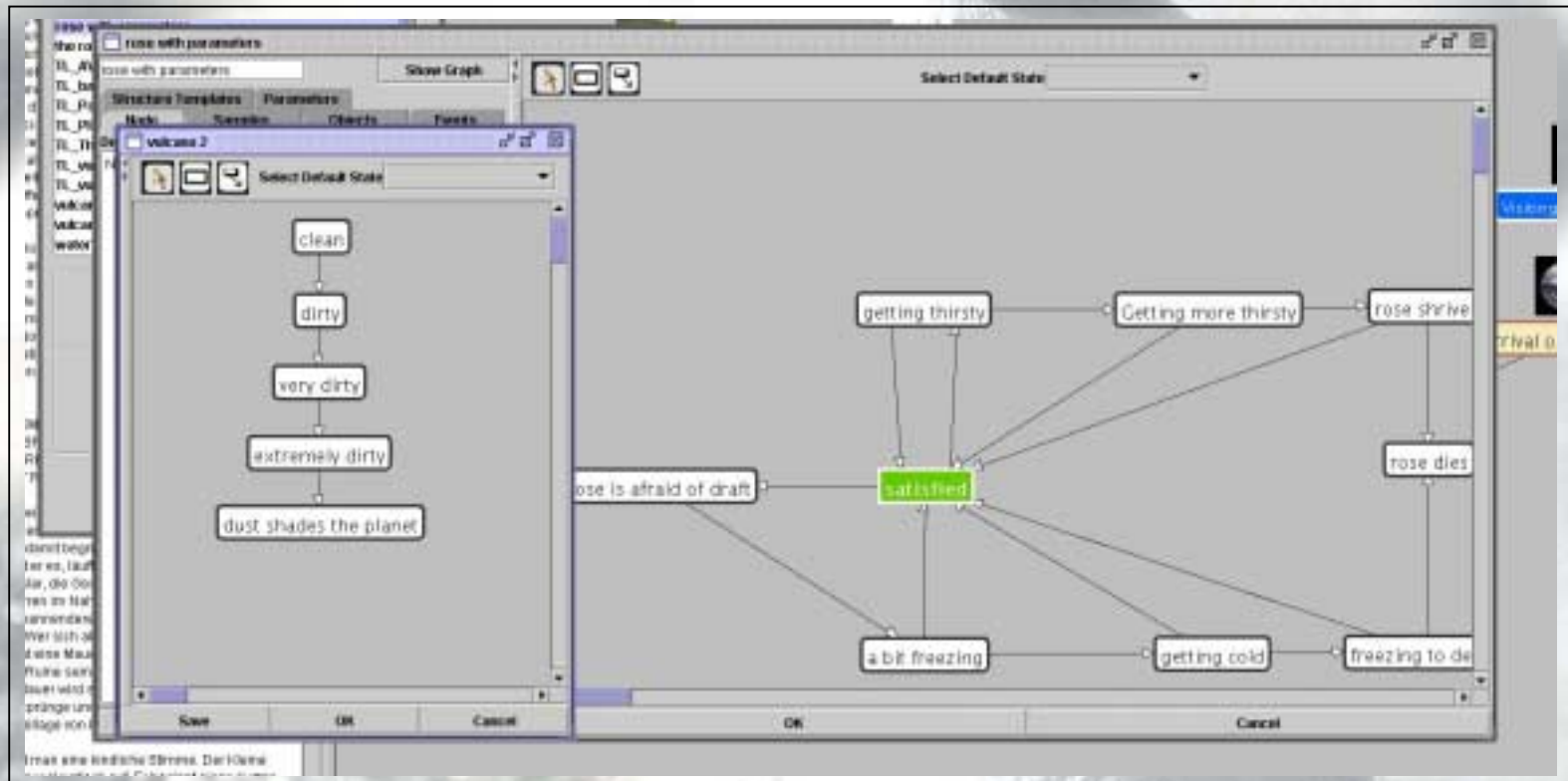
Typical objects:

- Timeline
- Counter
- Button
- Interaction device
- Door
- Health
- Aperture

...

Parallelization

Like the storygraph all *story relevant* objects are modeled (with nodes and parameters)



Scripting

So far:

Parallel graphs:

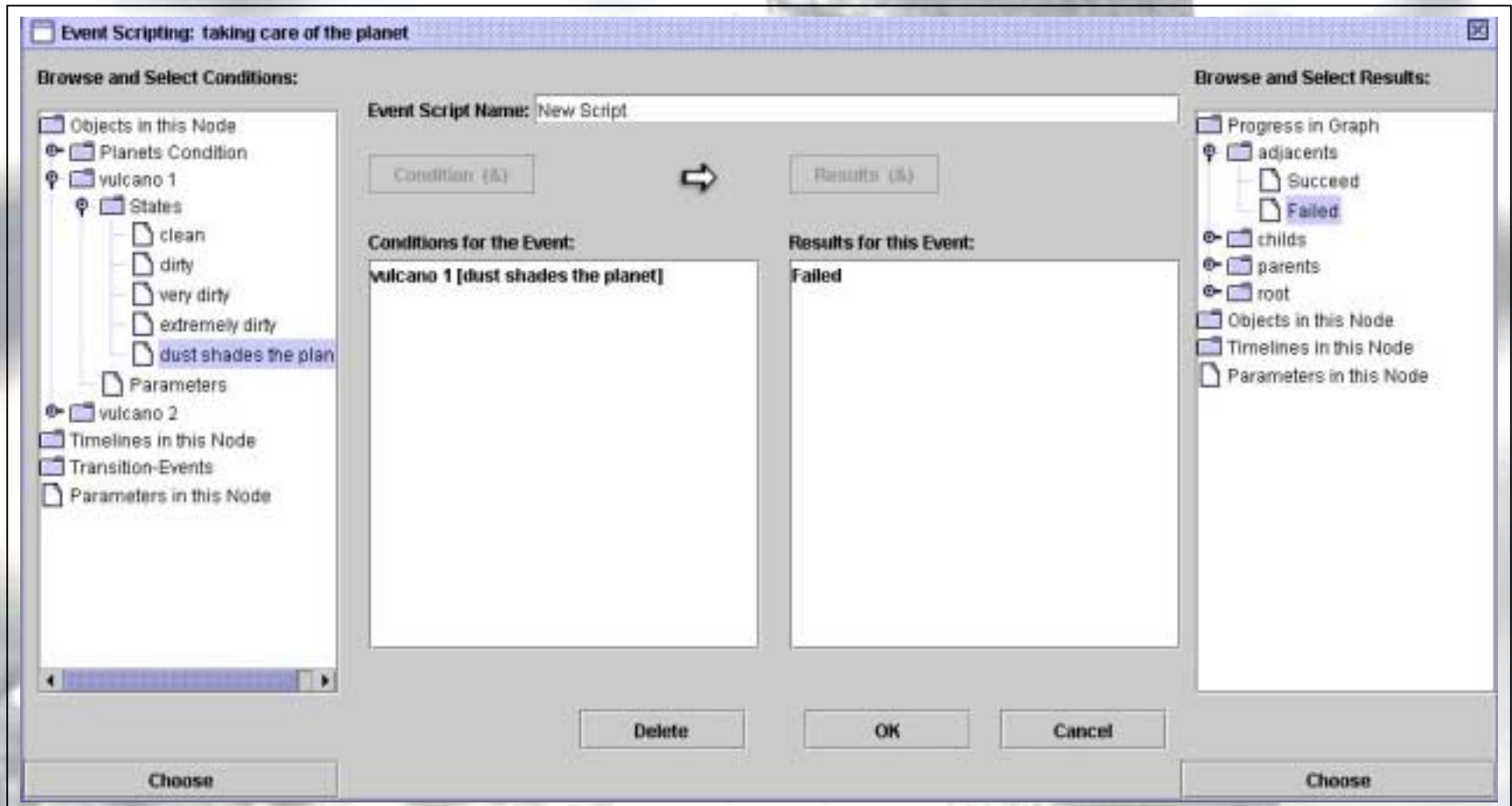
- Storygraph
- Object graphs

with storyboard and descriptive text

Now:

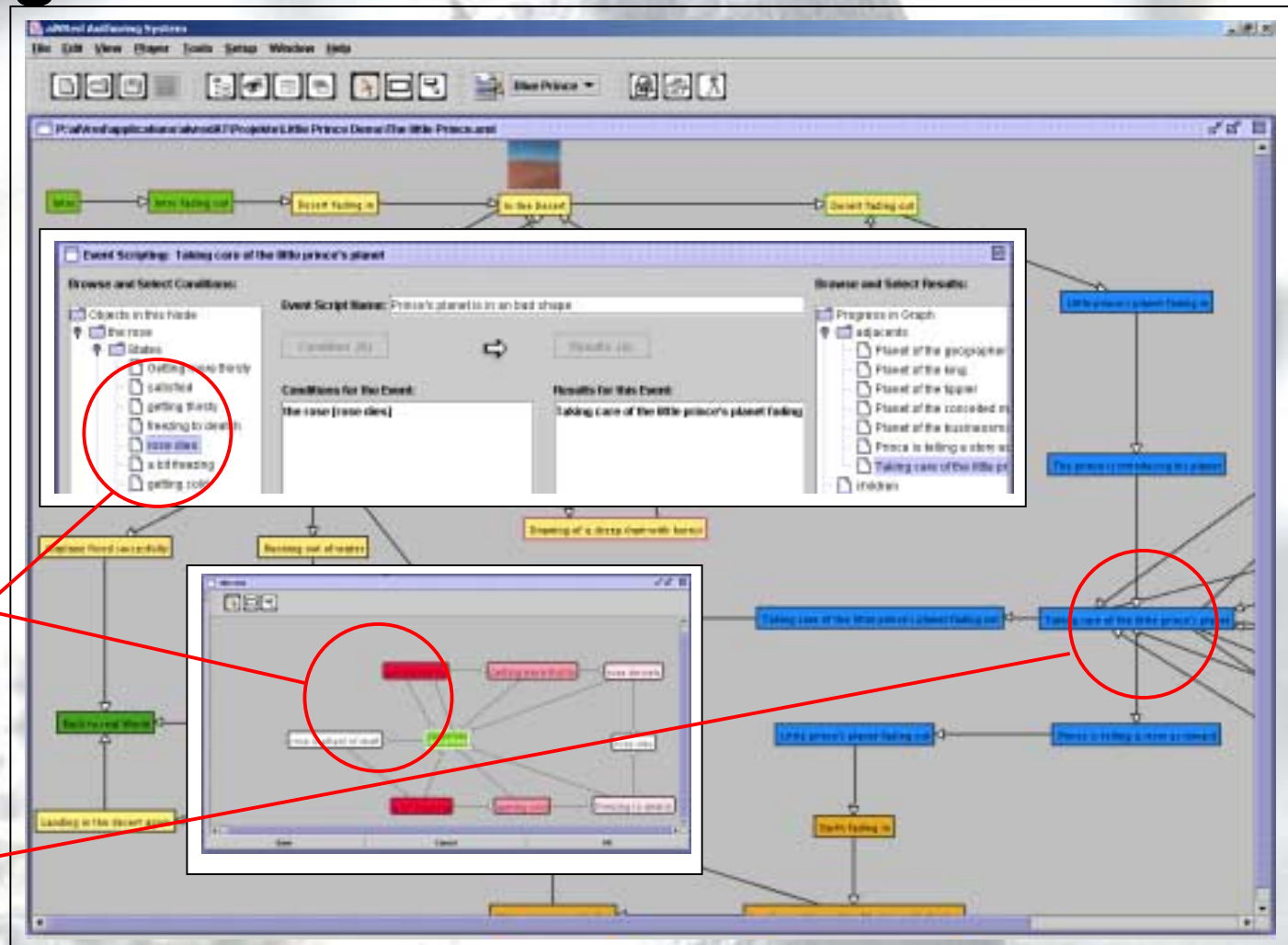
The author can define the interdependencies (scenario / story logic) between the graphs by *Event Scripts*.

Scripting



if-then-expressions

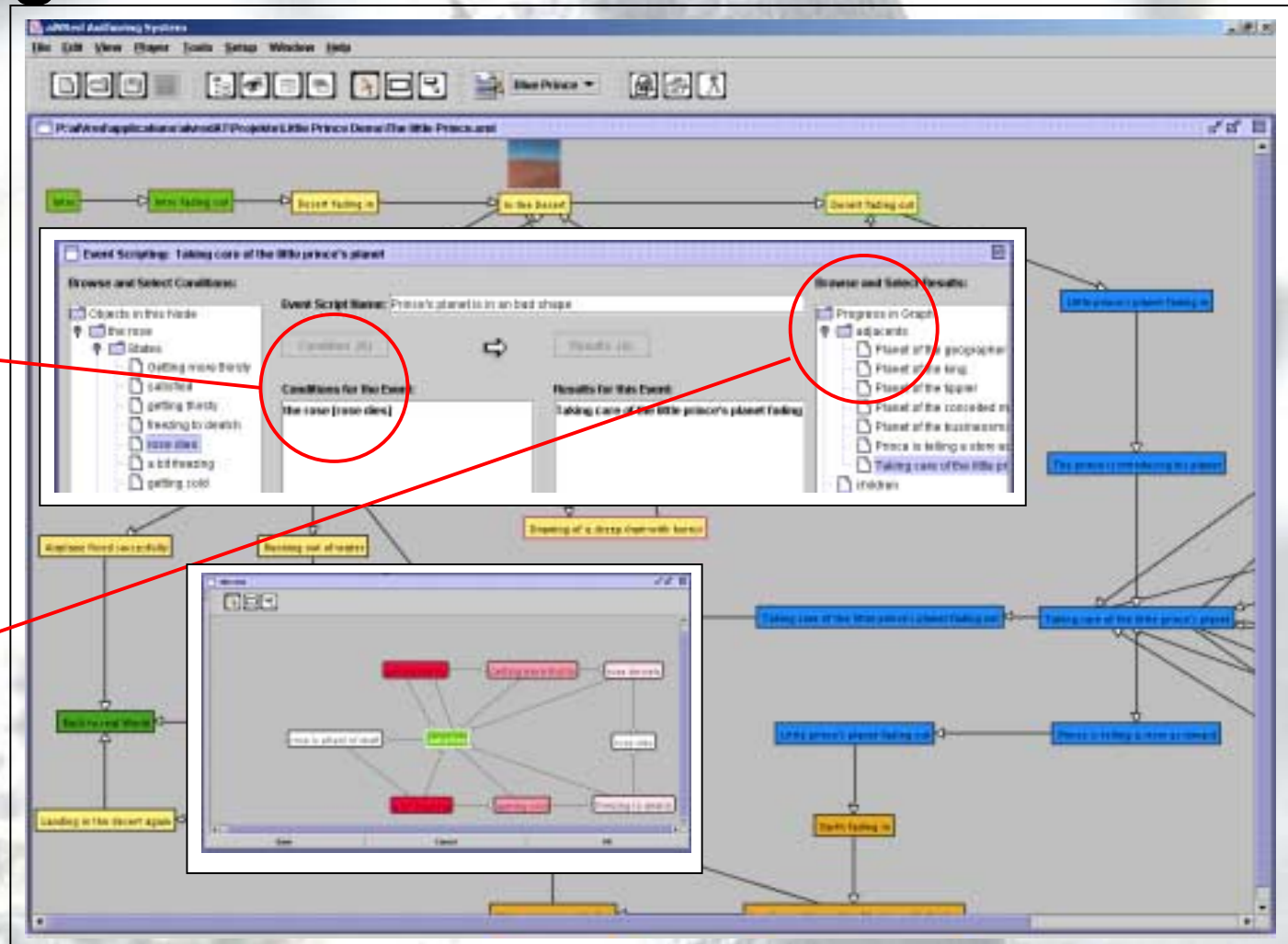
Scripting



Feasible Object States

Feasible Storygraph Progress

Scripting

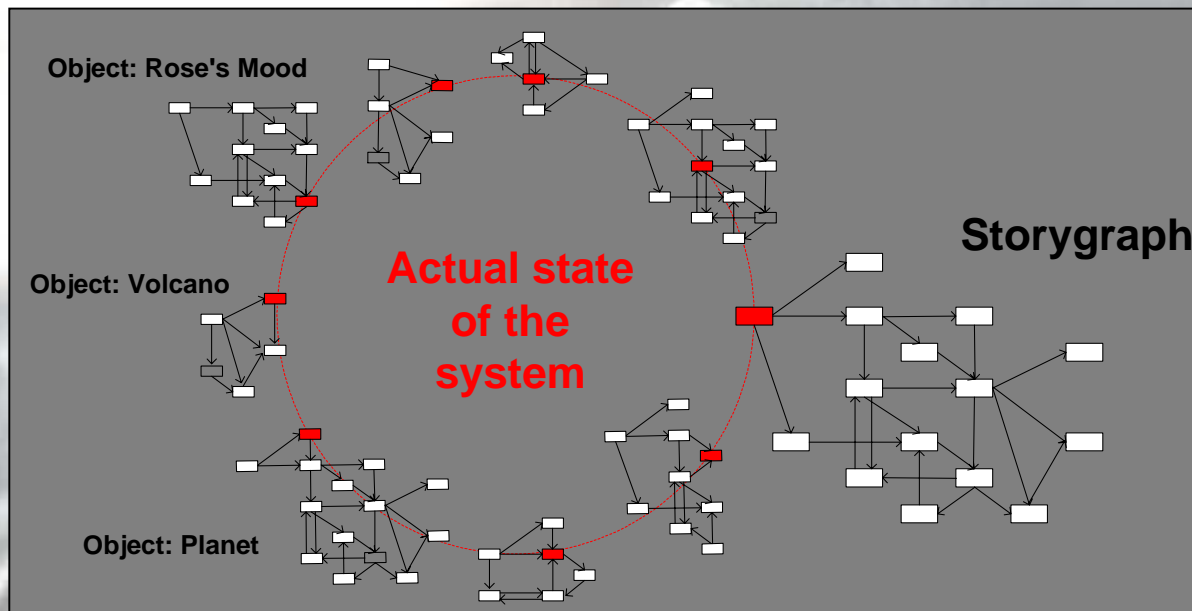


Conditions:
Object States

Results:
Object State Change,
Storygraph Progress

Scripting

- Authoring should be easy \Rightarrow only if-then-expressions
- Author is forced to define all envisioned states and parameters of the story
- Now: State of the story = set of all active nodes



Non-Linear Script

Result:

- Non-linear script and storyboard
- Unambiguous description of a system / story logic with the help of a rigorous structure and syntax

Nice...

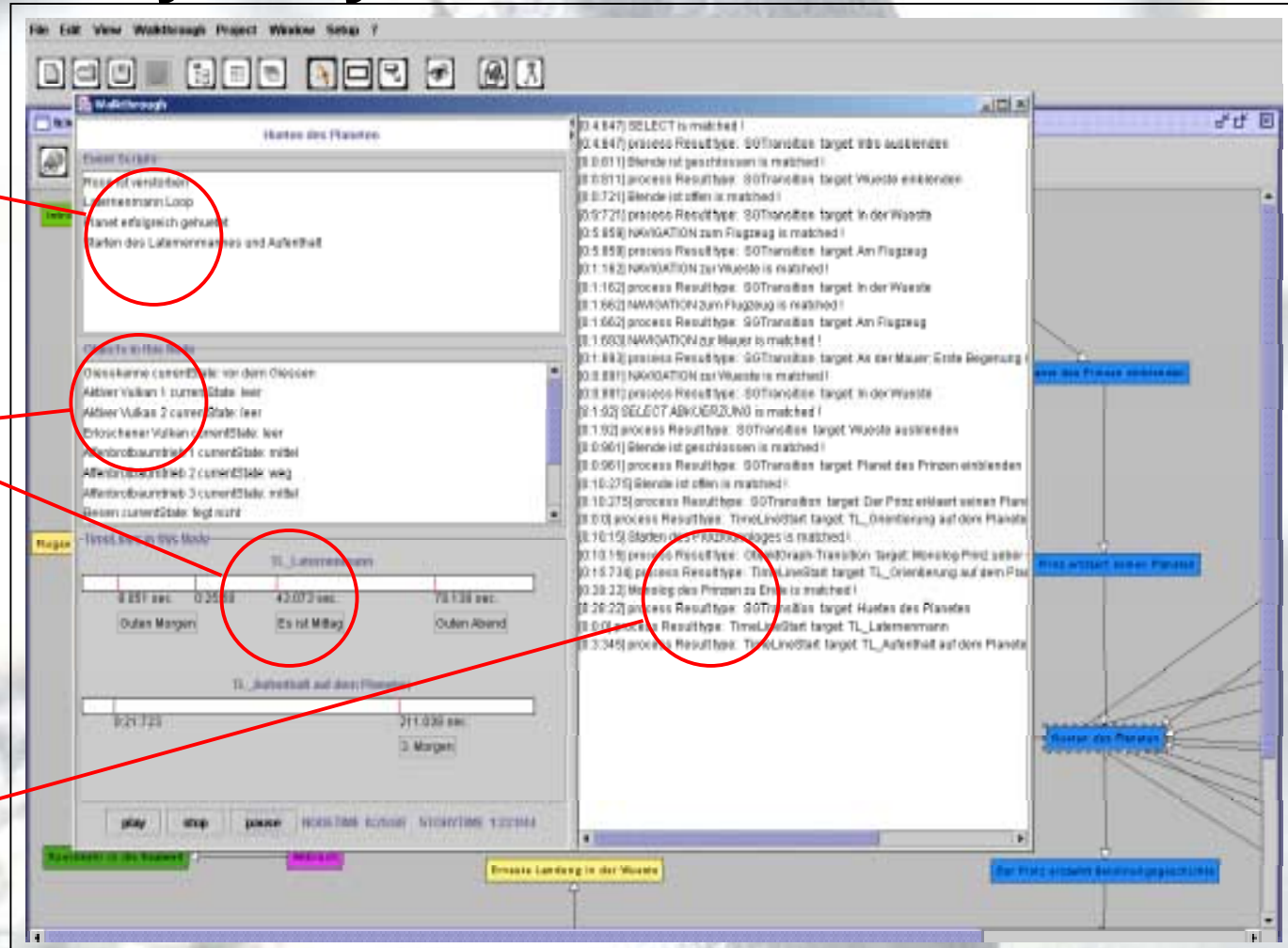
But can there be more?

Internal Story Player

Unambiguous description of a system / story logic with the help of a rigorous structure and syntax :

- ⇒ 'understandable' / executable for computers
- ⇒ might serve as direct input for VR / game / story engines
- ⇒ can be run with the *Internal Story Player* of the aVRed Authoring Tool
- ⇒ can be checked for timing and consistency

Internal Story Player

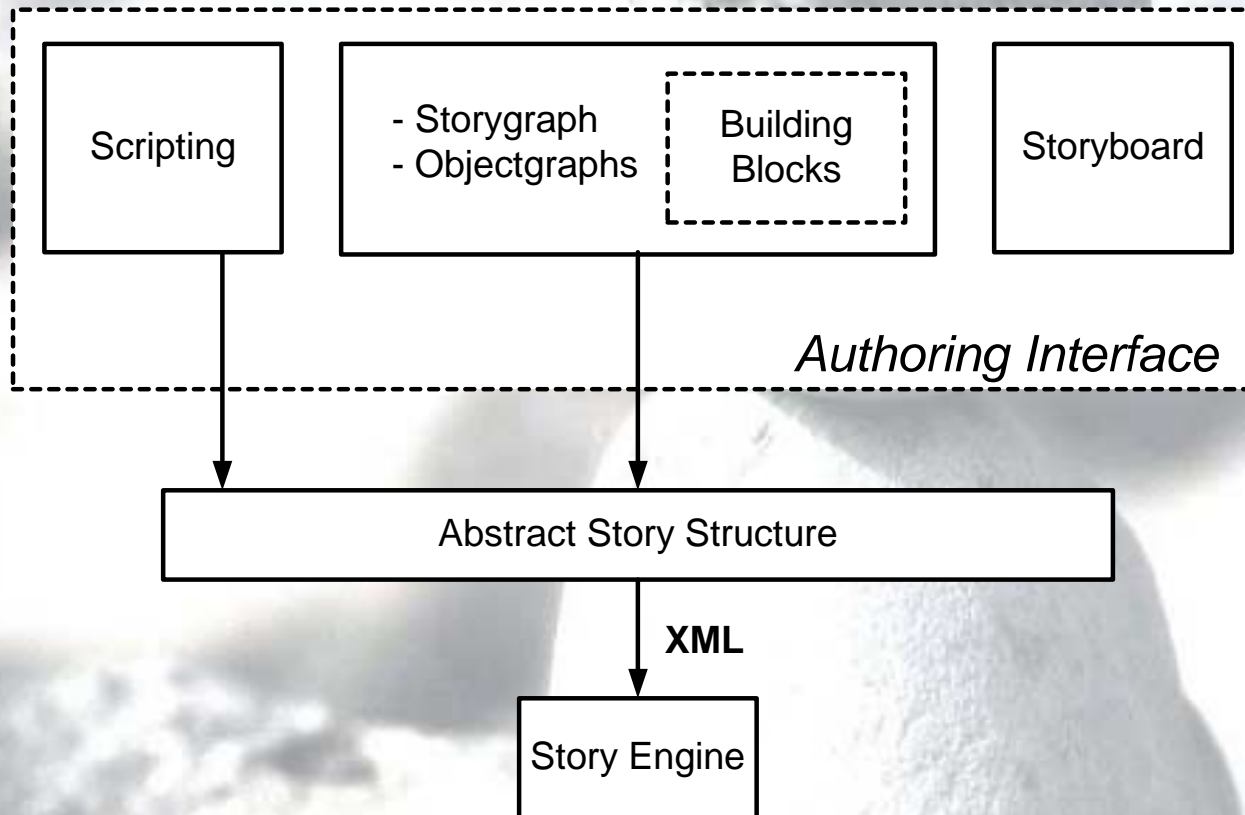


Progress Options
(selectable)

Current Object
States and
Active Timelines

Actual Progress
(Log)

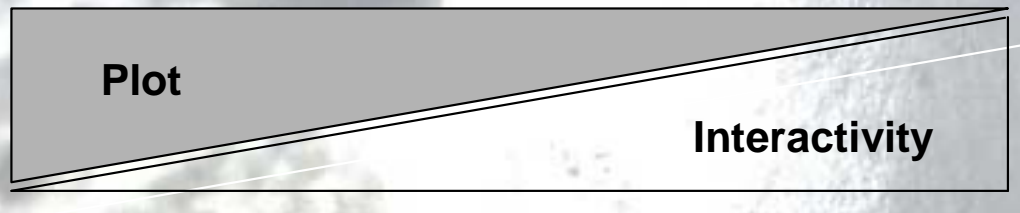
Output



Balance - strict progress vs. openness

Authors can choose everything from within the spectrum of

- Strict scenario progress (i.e. strong storygraph)
- Complete openness (i.e. transferring more influence to the parallel object graphs)



Balance - strict progress vs. openness

Scenario-*stabilizing*:

- rigid graph structure
- encapsulation / hierarchy
- (time management)

Scenario-*destabilizing*:

- circular constructions
- parallel graphs / heterarchy

Authors have to find the balance

Conclusion

Pros:

- Authors are enabled to define, organize, test their non-linear scenarios
- More complex / open scenarios
- Necessary change in the content production process
- modular / quick on-site changes possible
- versioning

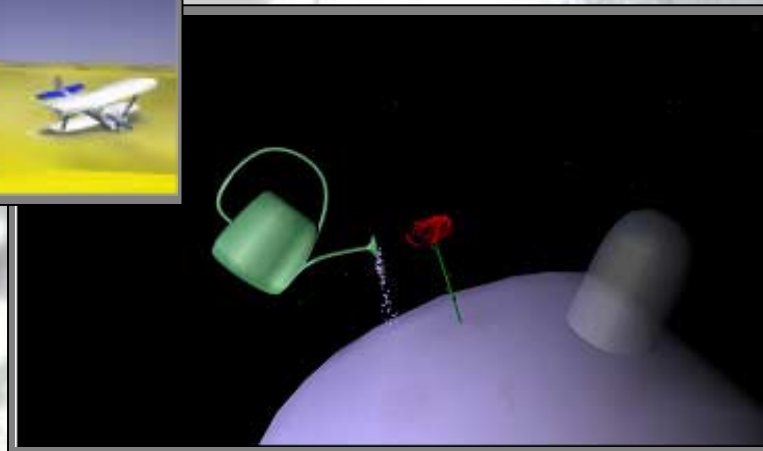
Cons:

- 'Rather use a napkin'
- Entire scenario stored in one single node
- (Author's control vs. user's freedom dilemma)

First Applications

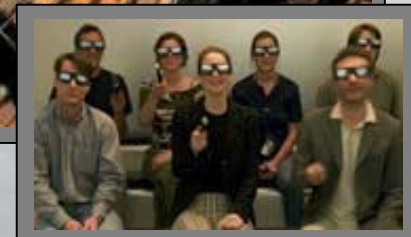
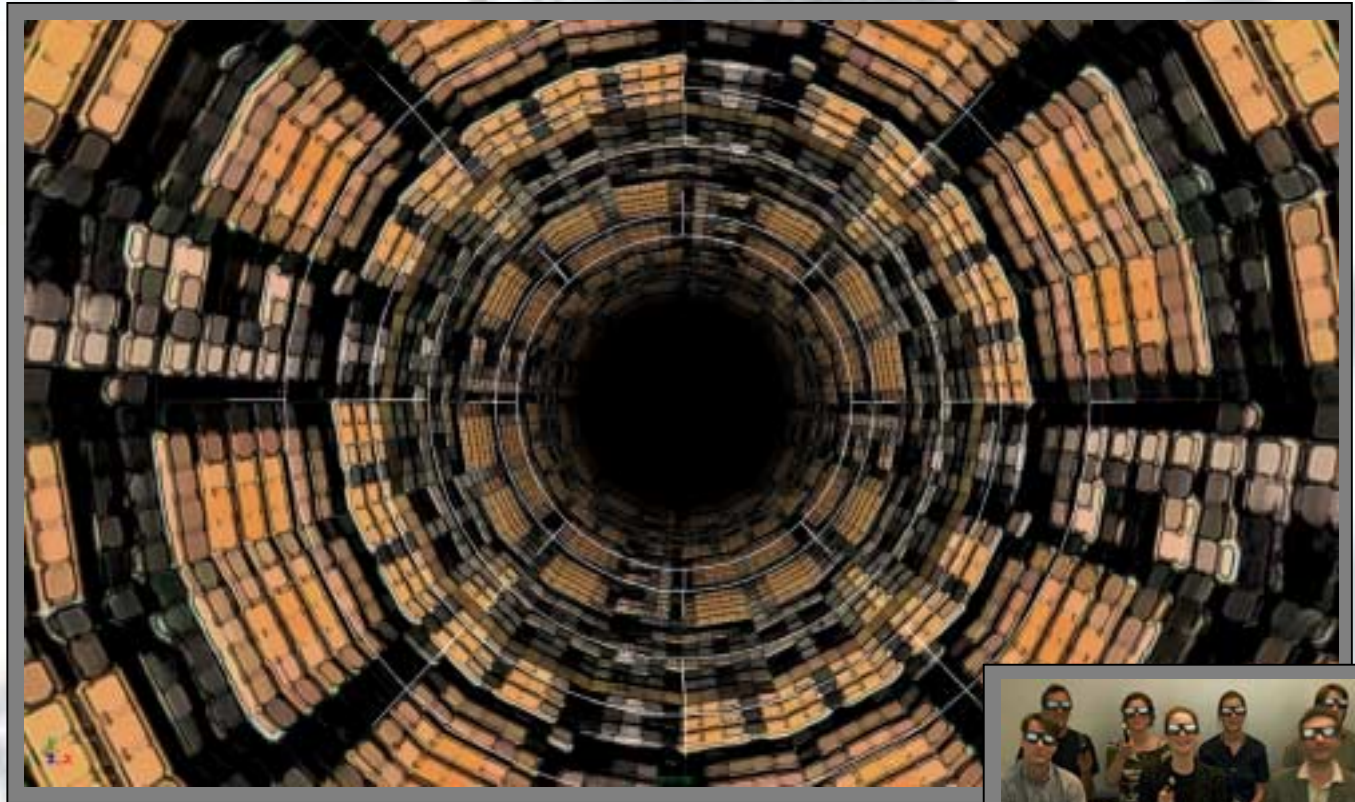
Test Scenario:

Taking care of the Little Prince's Planet (2002 / 2003)



© Pictures by [rmh]

First Applications



Permanent Installation ('Entropy') in the
Technisches Museum Wien (from May 2004)

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Further Applications

Authors are welcome to use the
aVRRed VR Authoring Tool !!!

If you are interested in using the tool, please contact
wages@nomadslab.org



Thank you!

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