

AEOLUS floors the move of ESOC Mission Spacecraft Simulators to LINUX

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Introduction

The Big Picture

- The planned transition
- The context for AEOLUS mission

The Approach for AEOLUS Simulator

- Parallel Development and Configuration
- Decision Point

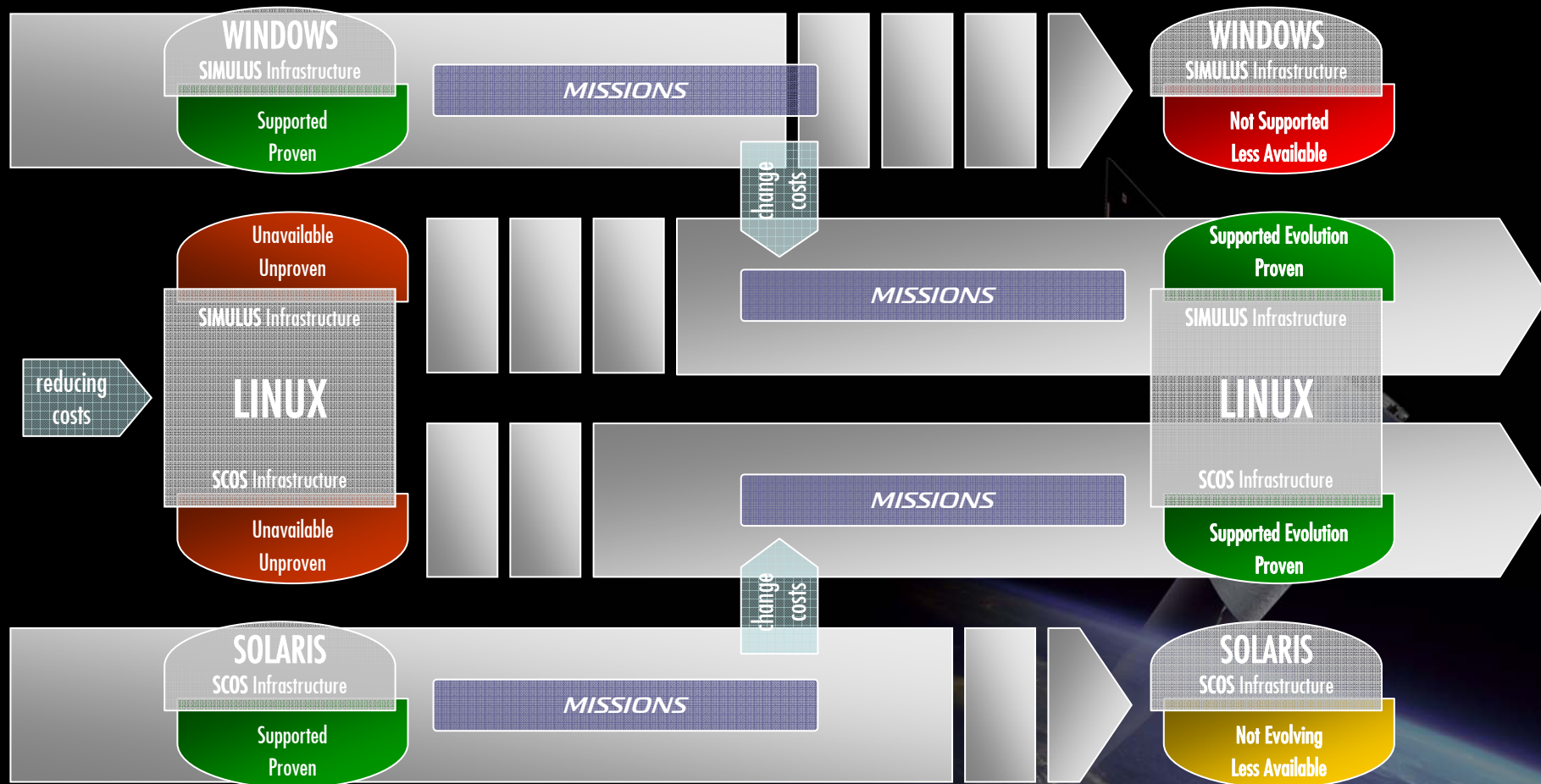
The Big Picture

- Impact on other mission

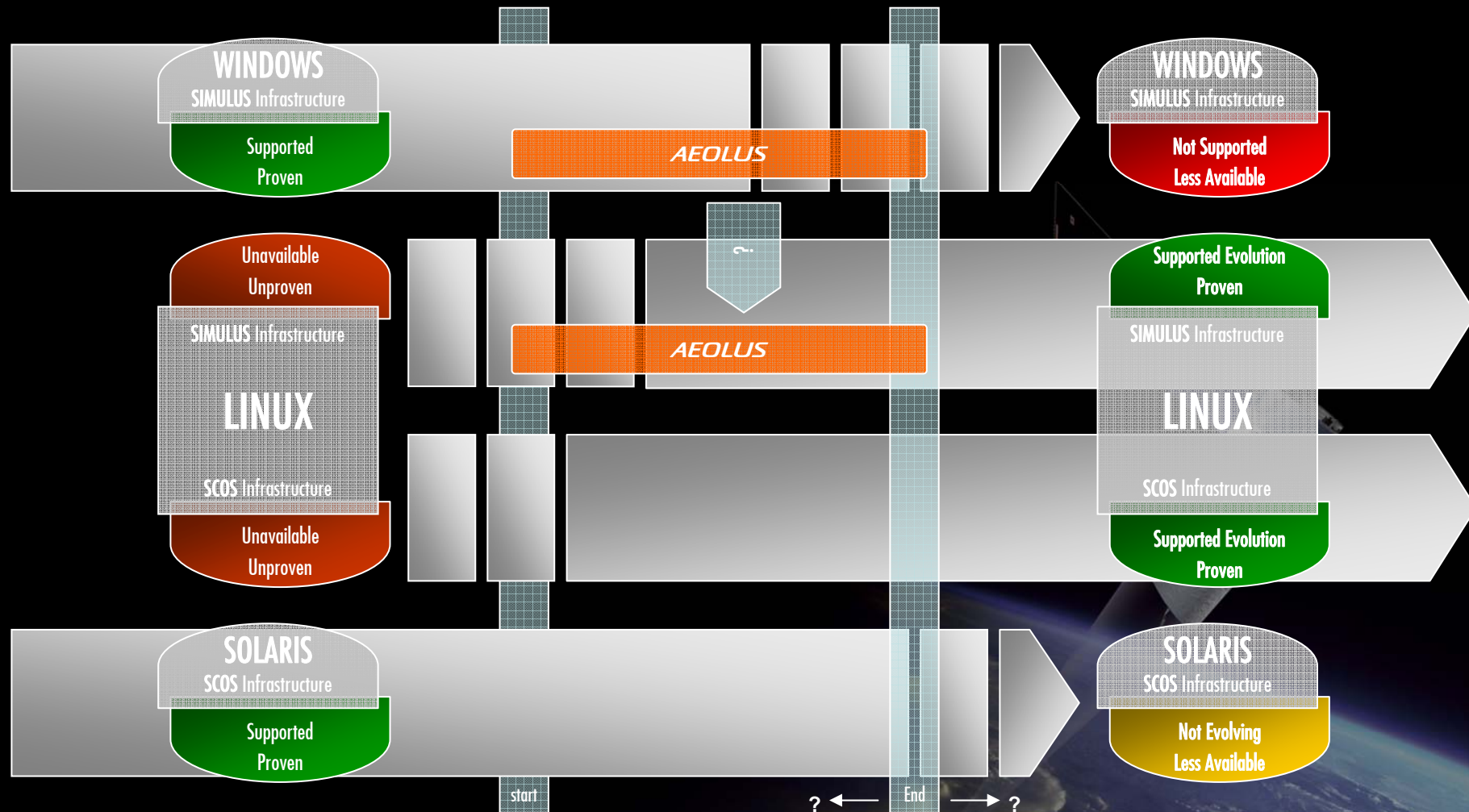
Conclusion



The Big Picture (the planned transition)



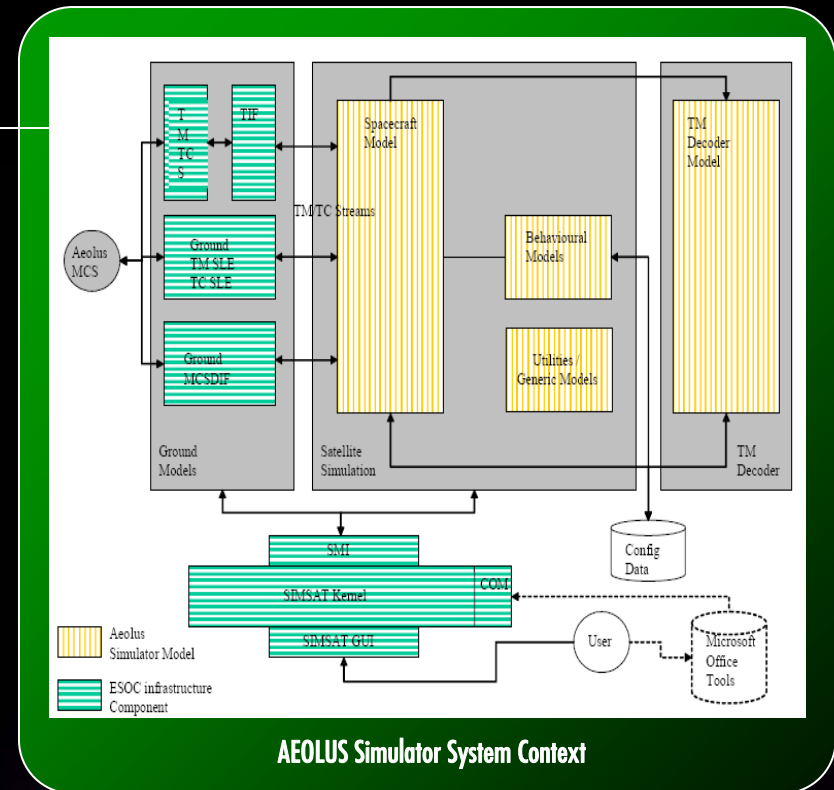
The Big Picture (the context for AEOLUS mission)



The AEOLUS Simulator

Atmospheric Dynamics Mission

- Equipped with the Atmospheric Laser Doppler Instrument (ALADIN) payload
- Provide global three-dimensional observations of wind profiles
- Sun synchronous, retrograde, near polar orbit



The Approach for AEOLUS

- **Options**

- Remain with the current infrastructure and Windows platform
 - already proven by other missions but becoming obsolete at the time of flying
- Become the first mission to use the new Linux platform
 - using the most modern system but embracing associated risks

- **A safe approach**

- Developing the AEOLUS Spacecraft Simulator on both platforms in parallel
- Reduce platform dependant solutions
- Decision point at first delivery including performance assessment

Parallel Development

Area	Development Infrastructure	Operating System	SIMSAT	TOTAL
Simulator	26	27	12	65
Telemetry Decoder	2	4	3	9
AQUA2	3	15	0	18
TOTAL	31	46	15	92

Distribution of Changes in the Source Code (*measured in source code modules modified*)

Source Code

- Different compilers and syntax (e.g. friend class, integers, case sensitive include files)
- different infrastructure (SIMULUS) with slightly different services
- major differences are in SIMULUS so only 92 modules modified in AEOLUS

Development Environment

- conversion of WINDOWS projects to LINUX makefiles (linking against different libraries for 32bit and 64bit)
- need for new tools (e.g. gcc debugger not enough for multithread environment)

Parallel Development

Emulator

- ESOC has developed a ERC32 processor emulator for 64bits (usable also in 32bit)
- TSIM emulator for the ERC32 processor only available in Windows (at the start)
- the LINUX Simulator version had to be made compatible with the ESOC emulator

Telecommand.txt (Windows 2003)

```
function Telecommand(TcName)
{
  this.TcName = TcName;
  this.TcFileName = TcName + ".txt";
  this.FileNameAndPath = this.Fso.BuildPath(
    this.TcFilePath, this.TcFileName);
  if ( !this.Fso.FileExists(this.FileNameAndPath) )
  {
    this.FileNameAndPath = this.Fso.BuildPath(
      this.TcWithParametersFilePath, this.TcFileName);
  }
  try
  {
    this.File =
    this.Fso.OpenTextFile(this.FileNameAndPath, 1);
    this.Executable = this.File.ReadAll();
    this.File.Close();
  }
}
```

LxTelecommand.txt (Linux)

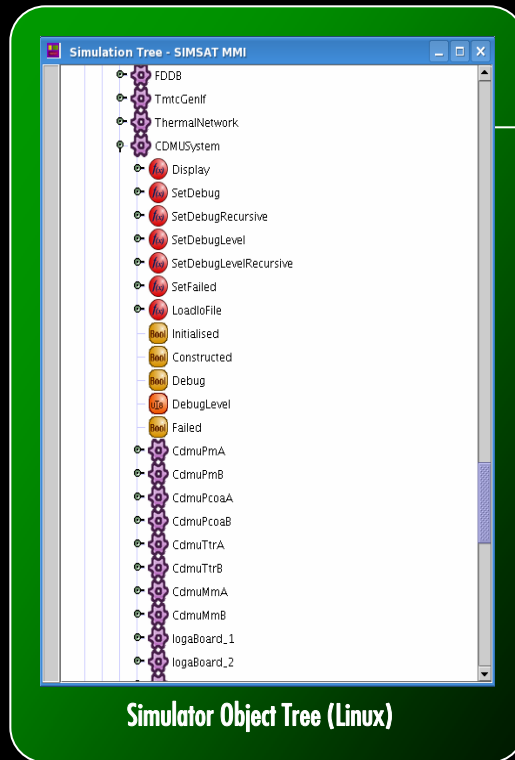
```
function Telecommand(TcName)
{
  this.TcName = TcName;
  this.TcFileName = TcName + ".txt";
  this.FileNameAndPath = this.TcFilePath + "/" +
  this.TcFileName;
  var fileTc = new java.io.File(this.FileNameAndPath);
  if ( !fileTc.exists() )
  {
    this.FileNameAndPath = this.TcWithParametersFilePath +
    "/" + this.TcFileName;
    fileTc = new java.io.File(this.FileNameAndPath);
  }
  try
  {
    this.Executable = "";
    var reader = new java.io.BufferedReader( new
    java.io.FileReader(fileTc) );
    var line;
    while( (line = reader.readLine()) != null )
    {
      this.Executable += line + "\n";
    }
    reader.close();
  }
}
```

Changes in Scripts – File System Call

SIMSAT Scripting

- LINUX Scripts had to be ported from JScript (MS) to JavaScript
- SIMSAT changes had to be masked by wrapper functions and aliases
- Access to the file system changed

Parallel Configuration



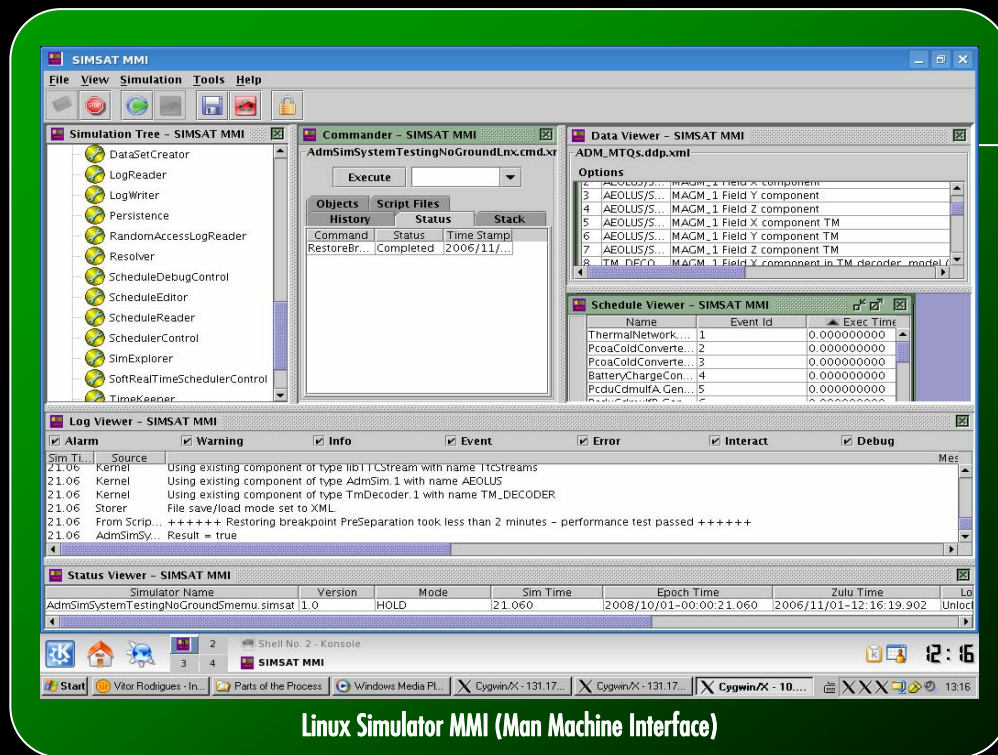
Data Display Changes

- Conversion Tool used to create displays from the Satellite Database had to be modified
- During porting a tight configuration control was needed

Configuration

- SIMSAT Linux Architecture files are now in “.xml” format so porting was necessary
- During porting a tight configuration control was needed

Parallel Configuration



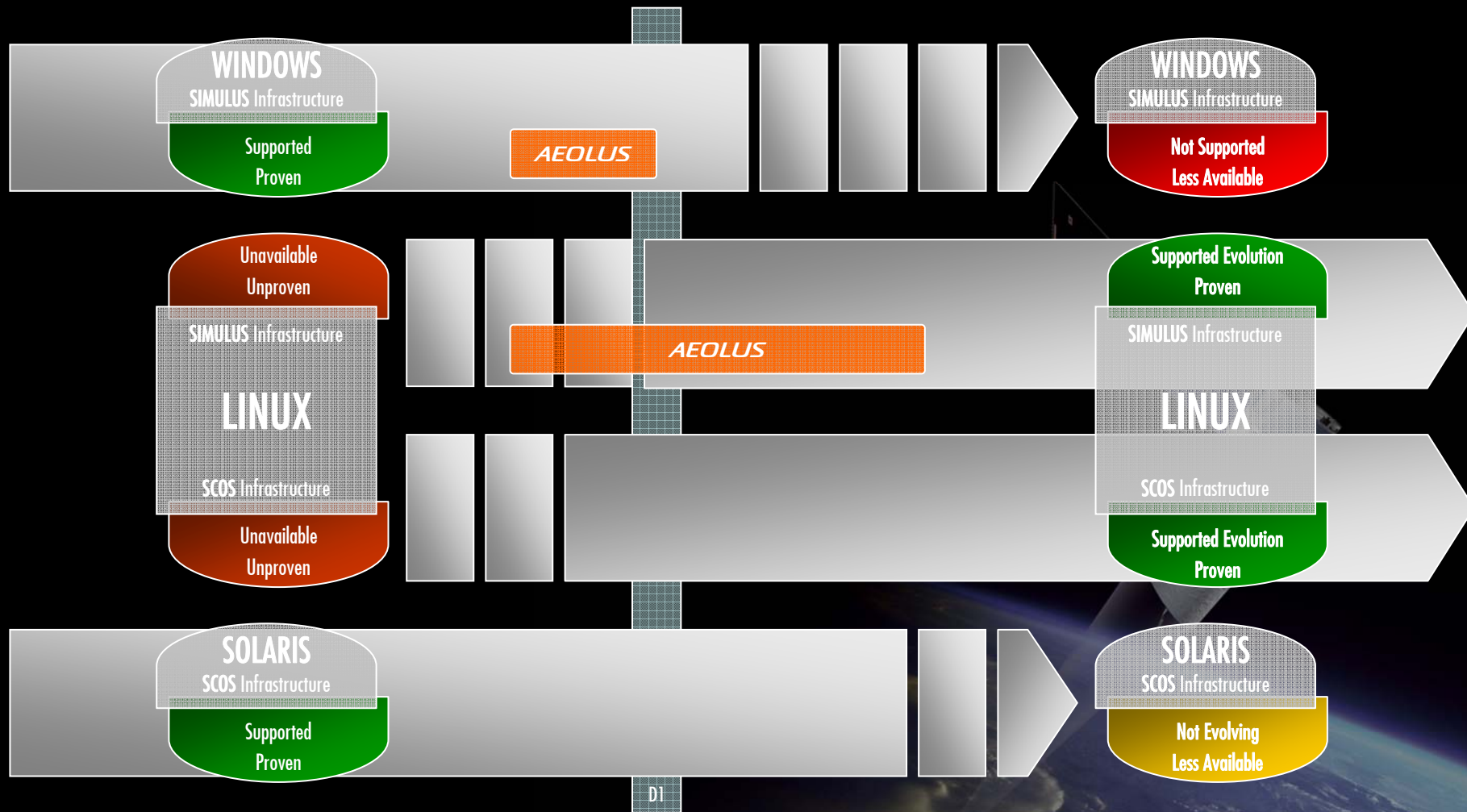
Operational Considerations

-Machines used to be accessed with Windows Remote Desktop

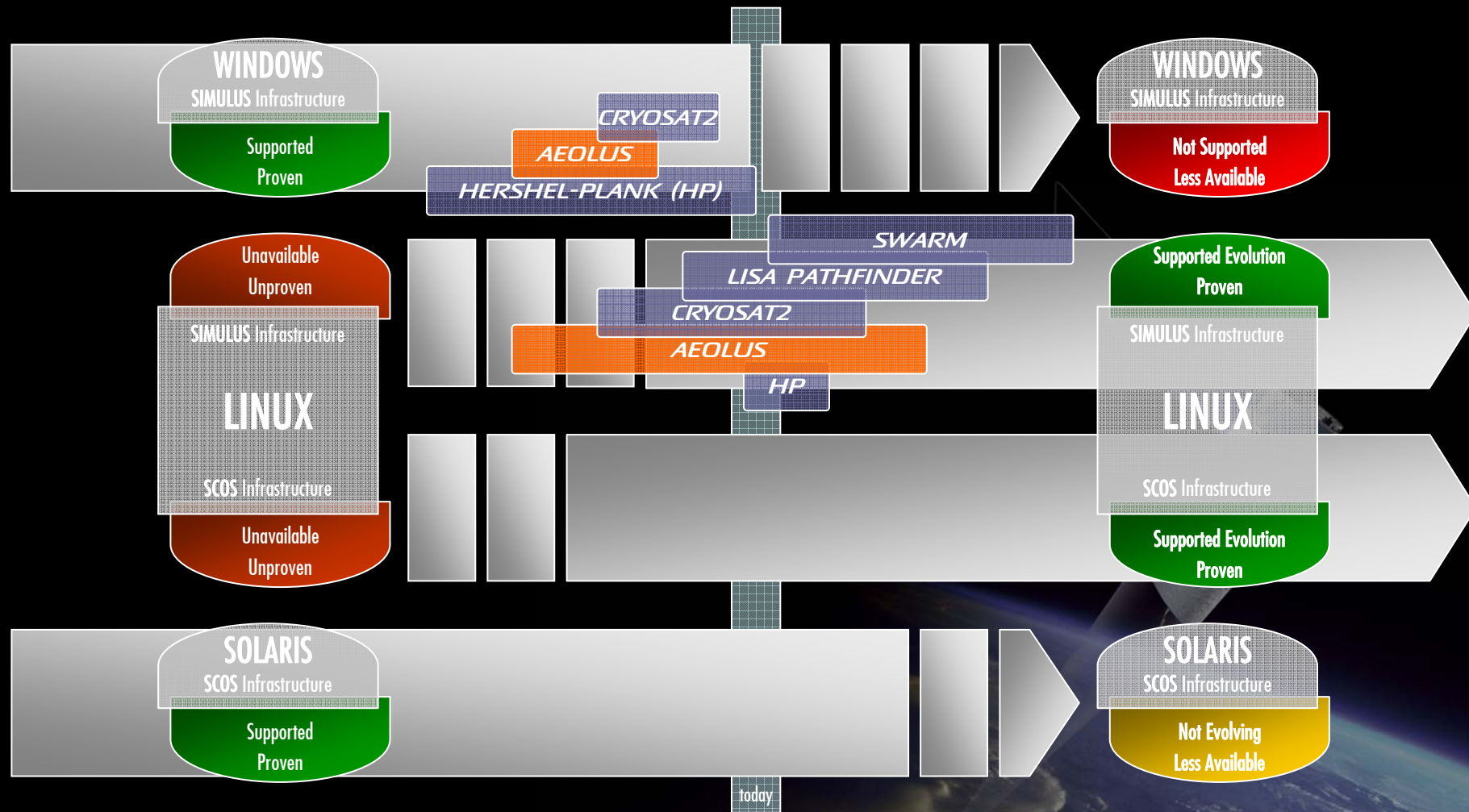
-New remote desktop application should be firewall compliant and display correctly

-VNC was the best solution (compared to EXCEED, CYGWIN and UNIXEXPORT)

Decision Point (Delivery 1)



The Big Picture (effect on other missions)



Conclusion

AEOLUS parallel development approach

- Slightly larger costs
- Lower transition risk

Infrastructure (SIMULUS)

- Real mission testing the software on new baseline (many and large models)
- Rapid evolution and user feedback

Benefits to Other Missions

- Aeolus LINUX Porting technical note providing a list of all the pitfalls
- More stable and useful infrastructure (SIMULUS) tested by AEOLUS
- Available know-how in the LINUX systems created in AEOLUS

