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GSAW 2004

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Simplifying ground segment reconfiguration



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GSAW 2003 quote

"Make accessing satellites as easy as accessing Google."

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Why it should be as easy as Google?

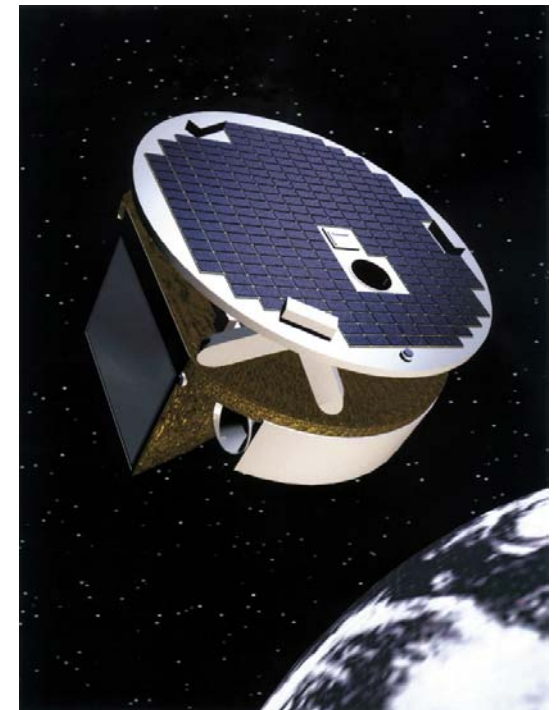
- **It's a just-in-time world !**
- **Reduction of barriers between payload and users**
- **Support to Time critical initiatives**
 - The International Charter on Space and Major Disasters



Google analogy: Remote data access

Scisat-1 LEOP support

- Effort of 60 days to ensure compatibility
- Skilled and trained professionals required





Google analogy: Remote data access

Access to NASDA web page

- Little effort, takes less than 2 seconds
- Only basic computer training required

```
C:\WINNT\system32\cmd.exe
Tracing route to tkes09.tksc.nasda.go.jp [133.56.12.35]
over a maximum of 30 hops:
  0  0 ms  0 ms  0 ms  192.168.0.1
  1  16 ms  14 ms  16 ms  Toronto-HSE-ppp3719032.sympatico.ca [65.95.51.1]
  2  17 ms  16 ms  17 ms  dis3-montrealak-Ulan100.in.bellnexxia.net [64.230.237.65]
  3  16 ms  17 ms  16 ms  64.230.240.57
  4  18 ms  16 ms  18 ms  64.230.240.50
  5  17 ms  16 ms  16 ms  if-1-0.core1.Montreal.Teleglobe.net [207.45.204.1]
  6  33 ms  32 ms  32 ms  if-2-0.core2.NewYork.Teleglobe.net [64.86.83.226]
  7  31 ms  33 ms  33 ms  if-14-0.core3.NewYork.Teleglobe.net [66.110.8.137]
  8  42 ms  177 ms  32 ms  if-6-0.core2.Newark.teleglobe.net [64.86.138.121]
  9  29 ms  30 ms  30 ms  if-9-0.core1.Ashburn.Teleglobe.net [64.86.83.214]
 10  29 ms  31 ms  31 ms  ix-5-0.core1.Ashburn.teleglobe.net [63.243.194.102]
 11  33 ms  31 ms  33 ms  p16-1-0-0.r21.asbnva01.us.bb.verio.net [129.250.5.21]
 12  32 ms  31 ms  31 ms  p16-0-1-1.r21.nycmny01.us.bb.verio.net [129.250.5.98]
 13  29 ms  31 ms  31 ms  p64-0-0-0.r20.nycmny01.us.bb.verio.net [129.250.2.32]
 14  62 ms  31 ms  38 ms  ge-0-0-0.r82.nycmny01.us.bb.verio.net [129.250.30.228]
 15  30 ms  32 ms  32 ms  ge-0.giant.nycmny01.us.bb.verio.net [129.250.10.106]
 16  236 ms  237 ms  235 ms  nii-gate2-P1-0.sinet.ad.jp [150.99.199.181]
 17  228 ms  228 ms  226 ms  nii-S1-P6-0.sinet.ad.jp [150.99.199.173]
 18  228 ms  227 ms  230 ms  JT-tokyo-S1-P8-0.sinet.ad.jp [150.99.197.21]
 19  238 ms  237 ms  239 ms  tsukuba-S1-P5-0.sinet.ad.jp [150.99.197.82]
 20  232 ms  229 ms  230 ms  NASDA.gw.sinet.ad.jp [150.99.64.20]
 21  1372 ms  229 ms  230 ms  133.56.197.9
 22  232 ms  232 ms  232 ms  usr001.tksc.jaxa.jp [133.56.196.3]
 23  239 ms  240 ms  241 ms  133.56.195.5
 24  240 ms  241 ms  239 ms  133.56.47.10
 25  234 ms  232 ms  233 ms  tkes09.tksc.nasda.go.jp [133.56.12.35]

Trace complete.
U:\Conferences\GSAW2004>
```



Google analogy: Remote data access

Similarities:

- **Goal: Access to data from remote location**
- **Environment: Geographically dispersed systems**
- **Ownership: Owned & operated by various organizations**

Differences:

- **Space industry lacks business model for open access**
- **Cost of assets**



Challenges

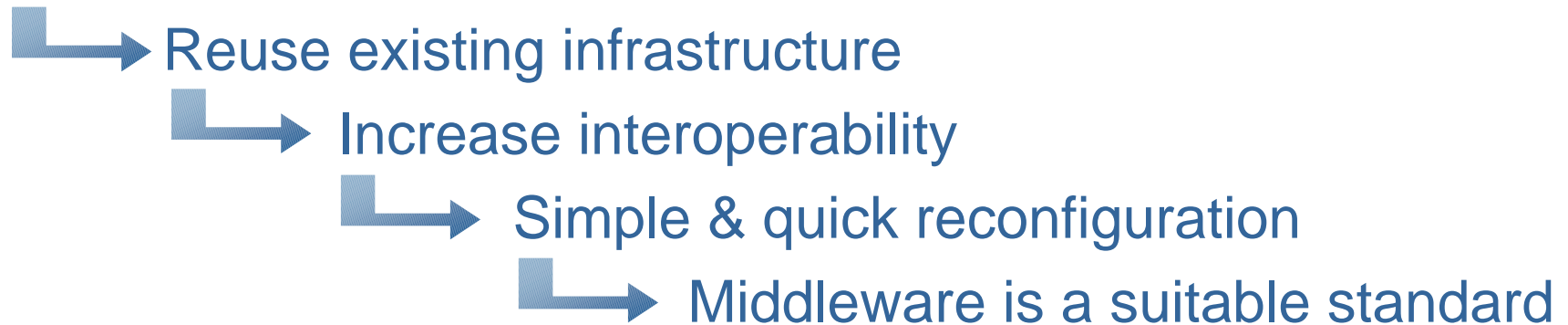
- **Software crisis**
 - **Lack of software standards**
 - **Segmentation / integration problem**
 - **Now a systems level problem**



Vision

- **Lead up time should be eliminated**
- **Achieve quick & simple reconfiguration**
- **Develop business model for open access**

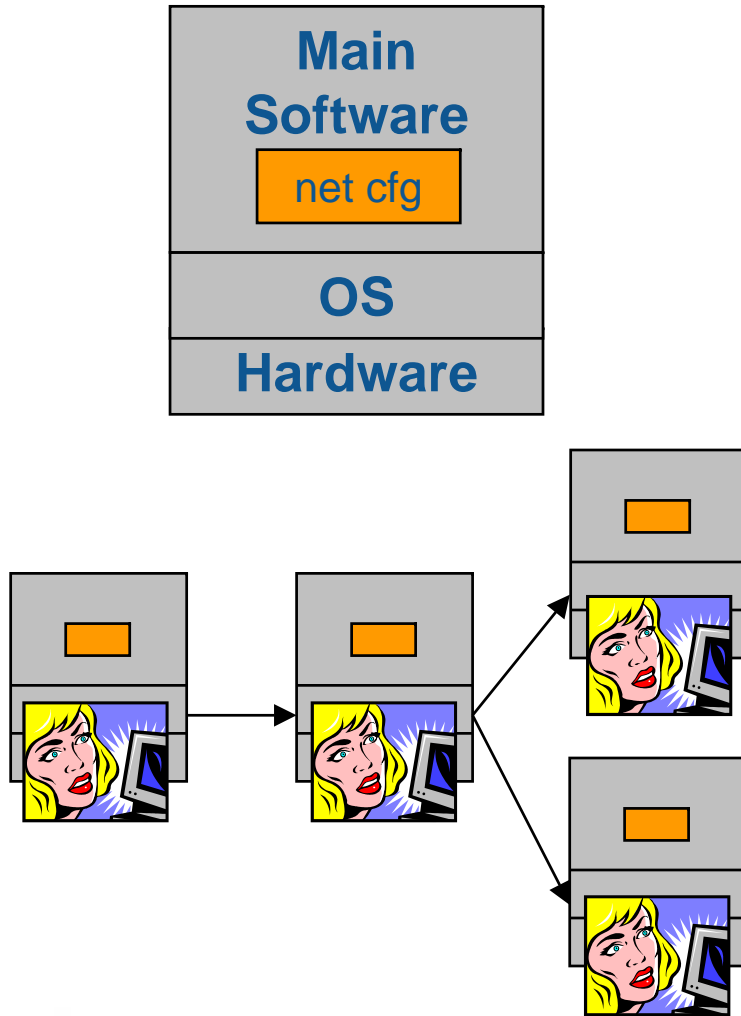
"Google" access to satellites



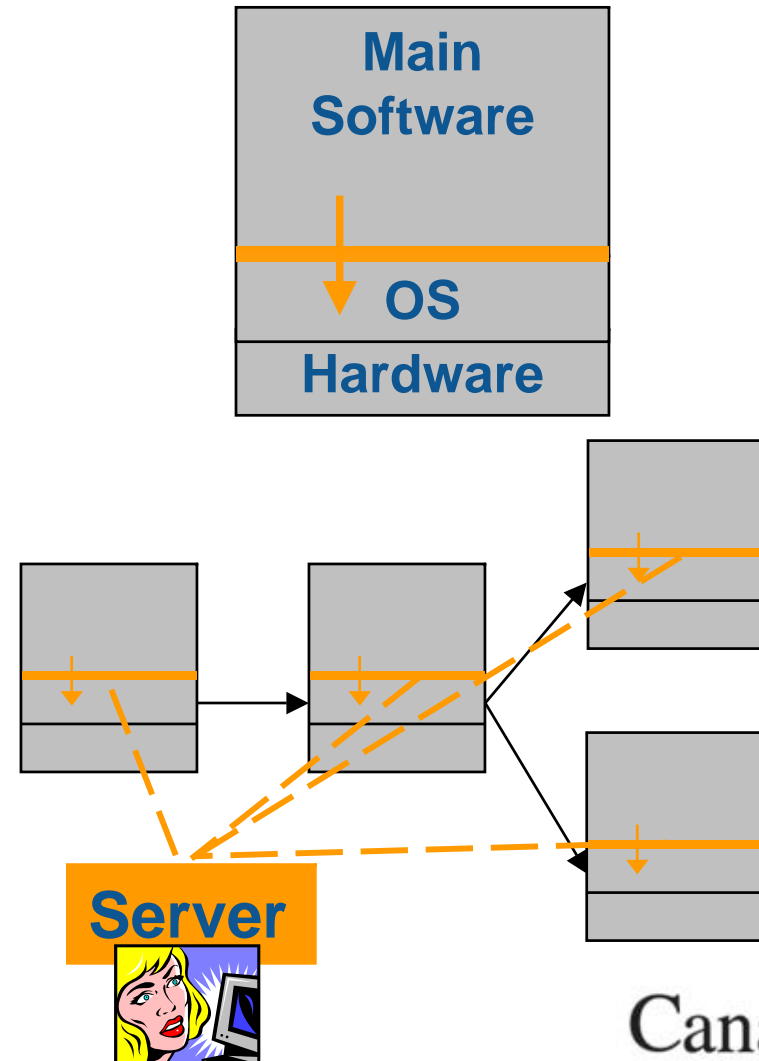


Networking & middleware

Without middleware



with middleware

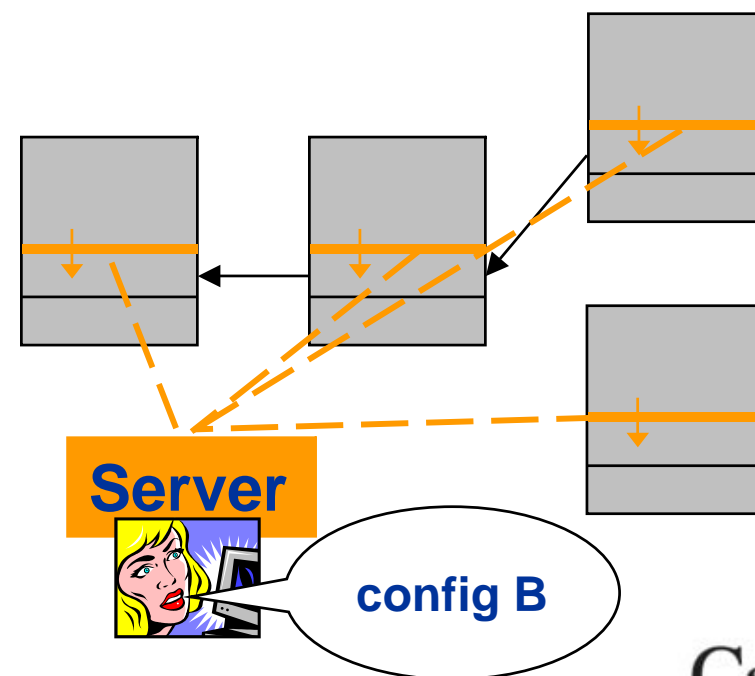
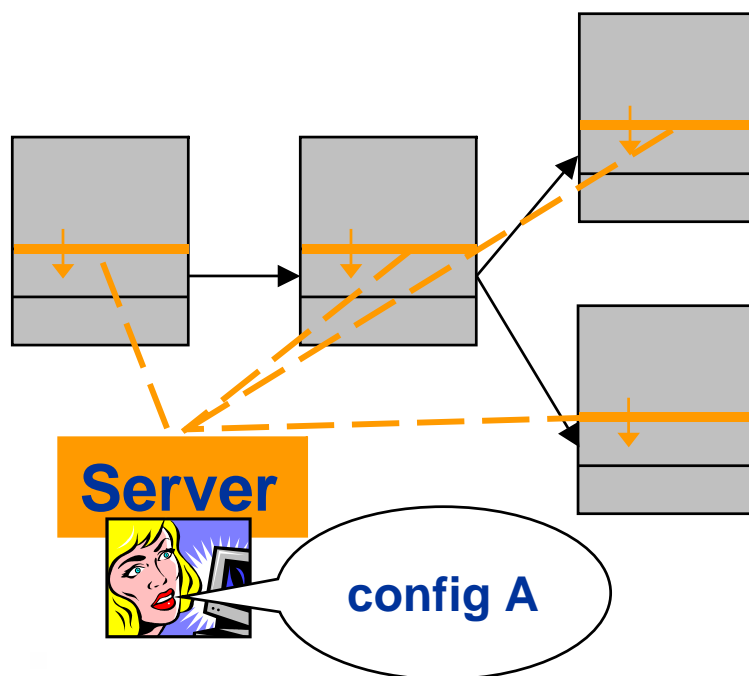




CSA research activity

Objective:

- Create configuration entities
- Autonomously reconfigure entire ground segment





System Overview

Driving requirements

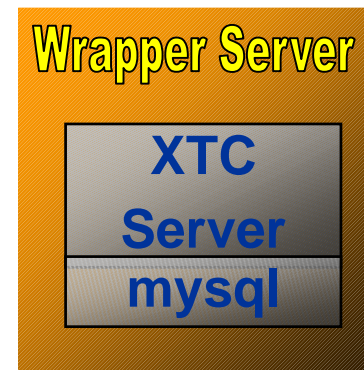
- Manage connections
- Manage and create configurations

Main components

- XTCommunicator, from Xiphos Technologies
- Parent server
- Distributed clients

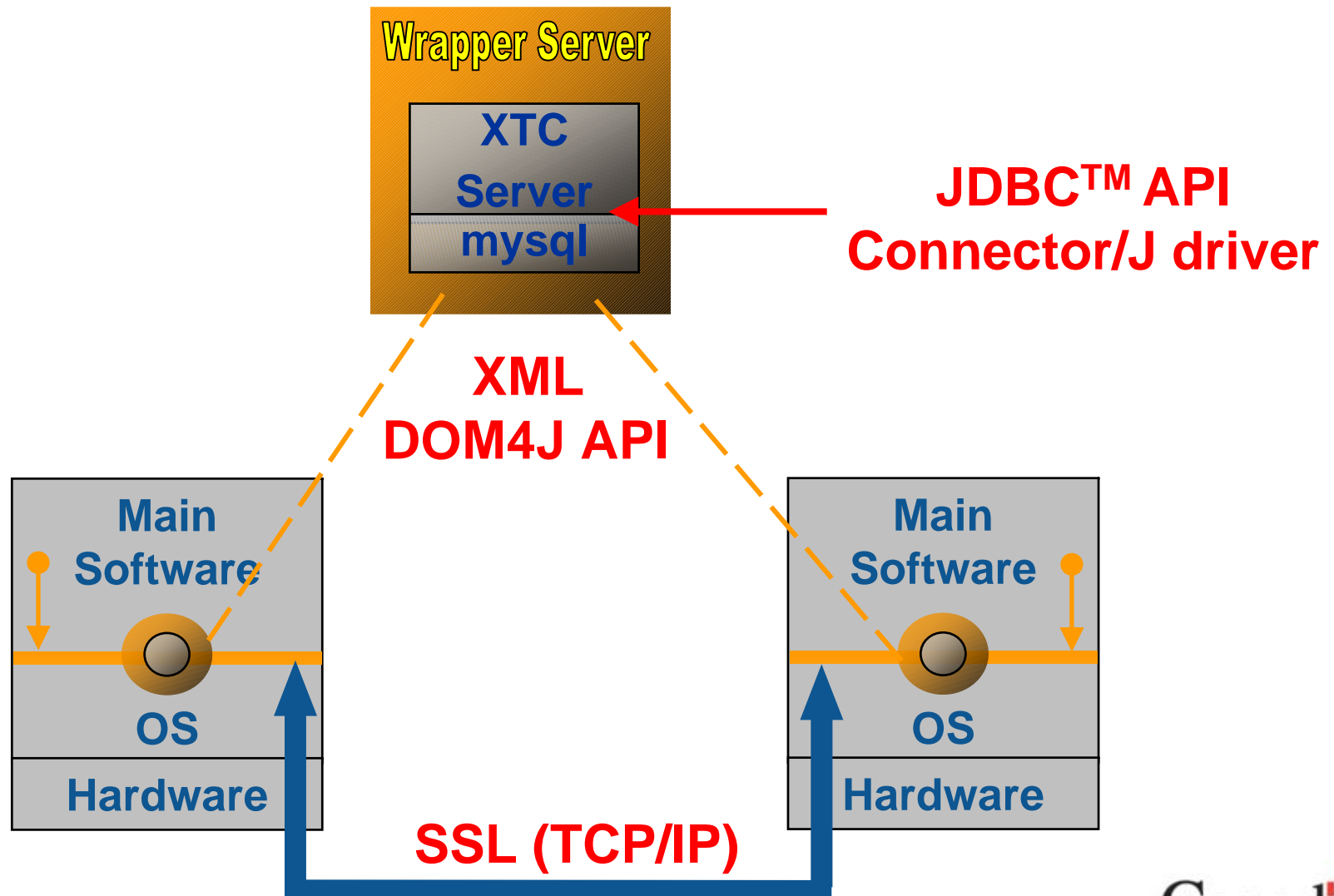


Java



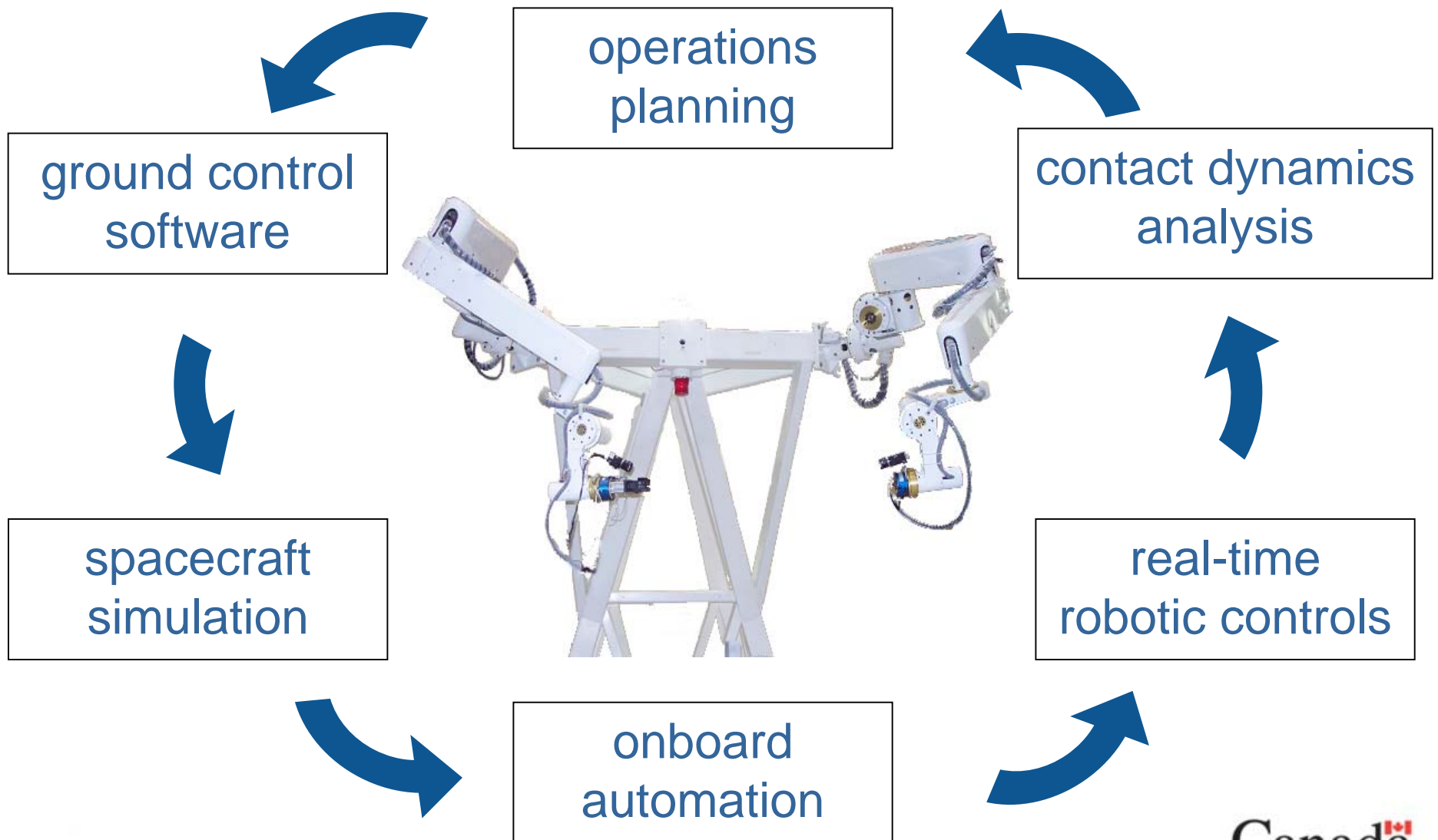


Components / Technology





Implementation : Space Servicing and Assembly





Lessons learned

The Good

- XML based interface
- JUnit : Automated regression testing

The Bad

- Data base interface: designing object data model

Solution

Will experiment with Evolution tool from Sygenics



www.sygenics.com



Conclusion

Solve the software crisis first

How ?

- **Continue R&D in ground segment field**
- **Support / contribute standards organization**
- **Demand interoperability from COTS vendors**