

Report and Comments from NEPTUNE and Alcatel

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Introduction

Alcatel and Neptune have been collaborating since 2001

I hope to learn if there are any ways Alcatel, Neptune and VLVnT can work together

In this presentation I'll show some of what Neptune doing

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<http://www.neptune.washington.edu>

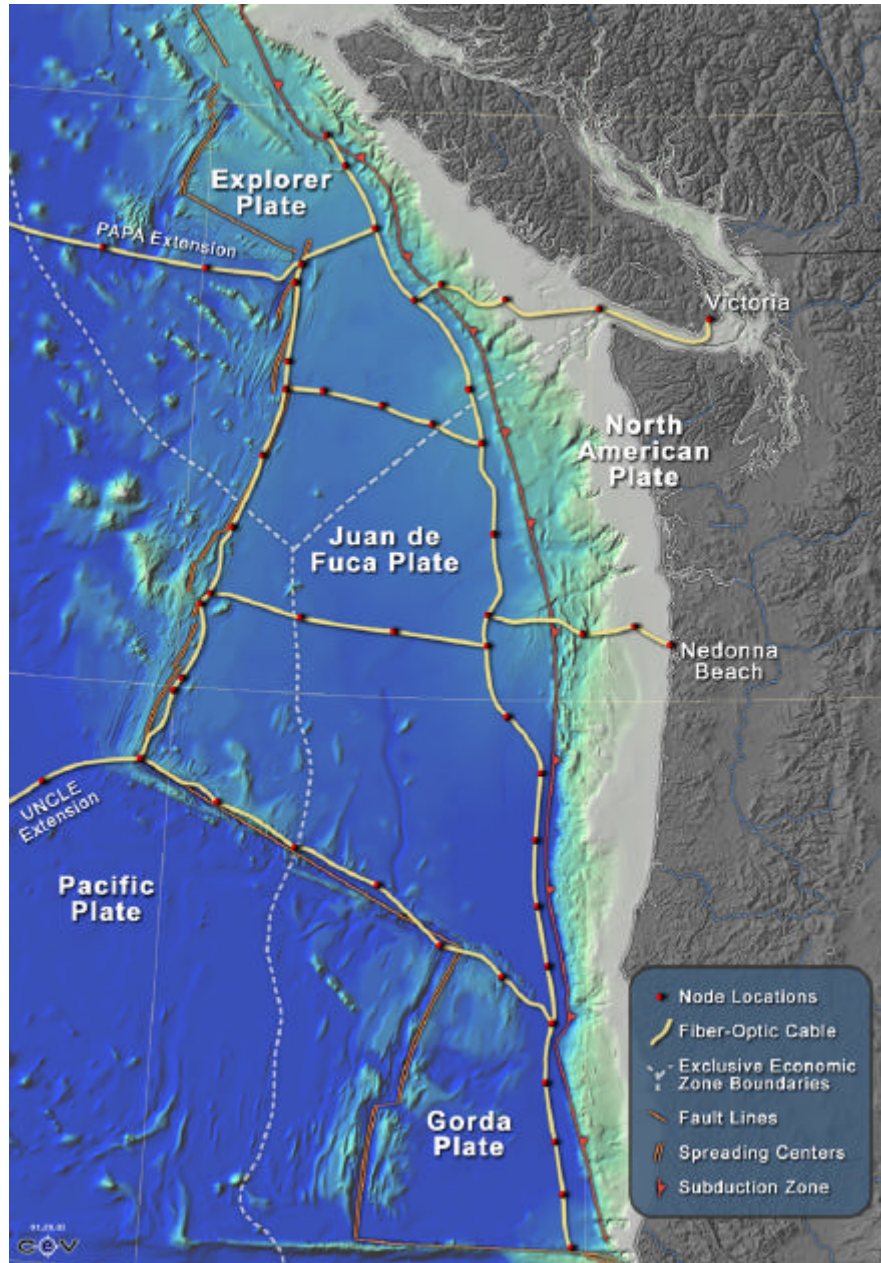
What is Alcatel?



- Multi-national company
- Installed world's first Transatlantic cable in 1856
- 40% share of submarine telecomms market
- Terabit cables
- Partner in NEPTUNE

What is NEPTUNE?

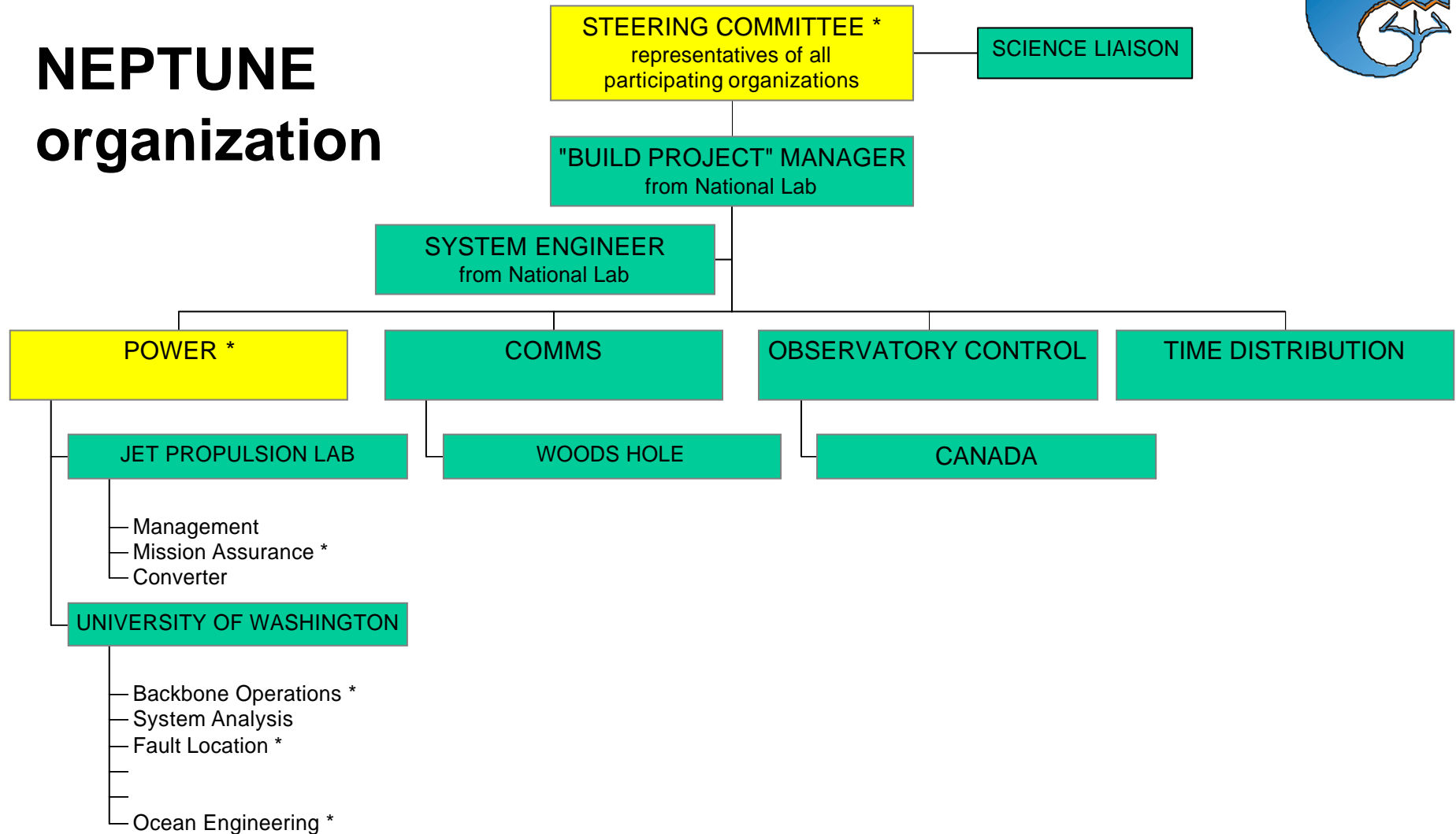
- 1000 x 500km network, from shore to 4 km depth
- 2 shore landings
- About 35 nodes
- Standardized science interface
- Up to 8 kW and 100 Mb/s



What is NEPTUNE?

- International collaboration to build new observatory for ocean sciences
- University of Washington
- Jet Propulsion Laboratory
- Woods Hole Oceanographic Institute
- Monterey Bay Aquarium Research Institute
- Institute for Pacific Ocean Science and Technology
- Herzberg Institute for Astrophysics
- University of Victoria
- This group is developing the infrastructure to provide power and communications to the sea floor

NEPTUNE organization



* Alcatel has a role in these activities

NEPTUNE power subtask: partial status

Converter	Modelling	complete
	Prototype	4-stage complete
		16-stage PCB being designed
	MARS version	planned
	NEPTUNE version	planned
Backbone	Modelling	In progress
System Analyses		In progress
Packaging		Under discussion

Concept Review was June 2002

Preliminary Design Review planned for December 2003

MARS converter to be tested spring 2004

LEVELS of Requirements

1	Affects everything	Do you want to allow for other (ocean) scientists to connect to network Discussions include Sponsor
2	Affects science	What <i>exactly</i> are you going to measure? Discussions include scientists, Steering Group
3	Affects system	Will you use connectors, or are they too unreliable? Approval from System Engineer needed
4	Affects subsystem	What kind of power converters will you use? Approval from Subsystem Manager needed

Quality, Mission Assurance, Reliability

What are some representative reliabilities ?

Washing machine: Fails once in 3 years

TV: Fails once in 10 years

Alcatel repeater: less than one failure in the life of the system, roughly speaking 1 failure in 2500 years

Galileo space craft: ultimate possible reliability

What if
an ***Alcatel repeater*** had the same reliability as a TV?

A good TV may go wrong once in 10 years

replacing a repeater in the ocean is expensive, \$1M

repair time is about 2wks

5000km system may have 100 repeaters

Therefore:

about 10 repeaters / year will fail

cost of maintenance \$10M / year

total down time 20 weeks

What if
a **Neptune Node** had the same reliability as a TV ?

replacing a node in the ocean is difficult
repair time could be as much as 6 months
3000km system may have 35 nodes

Therefore:

about 3 - 4 nodes / year will fail

cost of node replacement with free ship time \$6 -8M

system partially down for many months

What if
a ***Neutrino Observatory*** had the same reliability ?

replacing a node in the ocean may be difficult

repair time ? You decide!

system may have 5000 detectors and 100 junction boxes

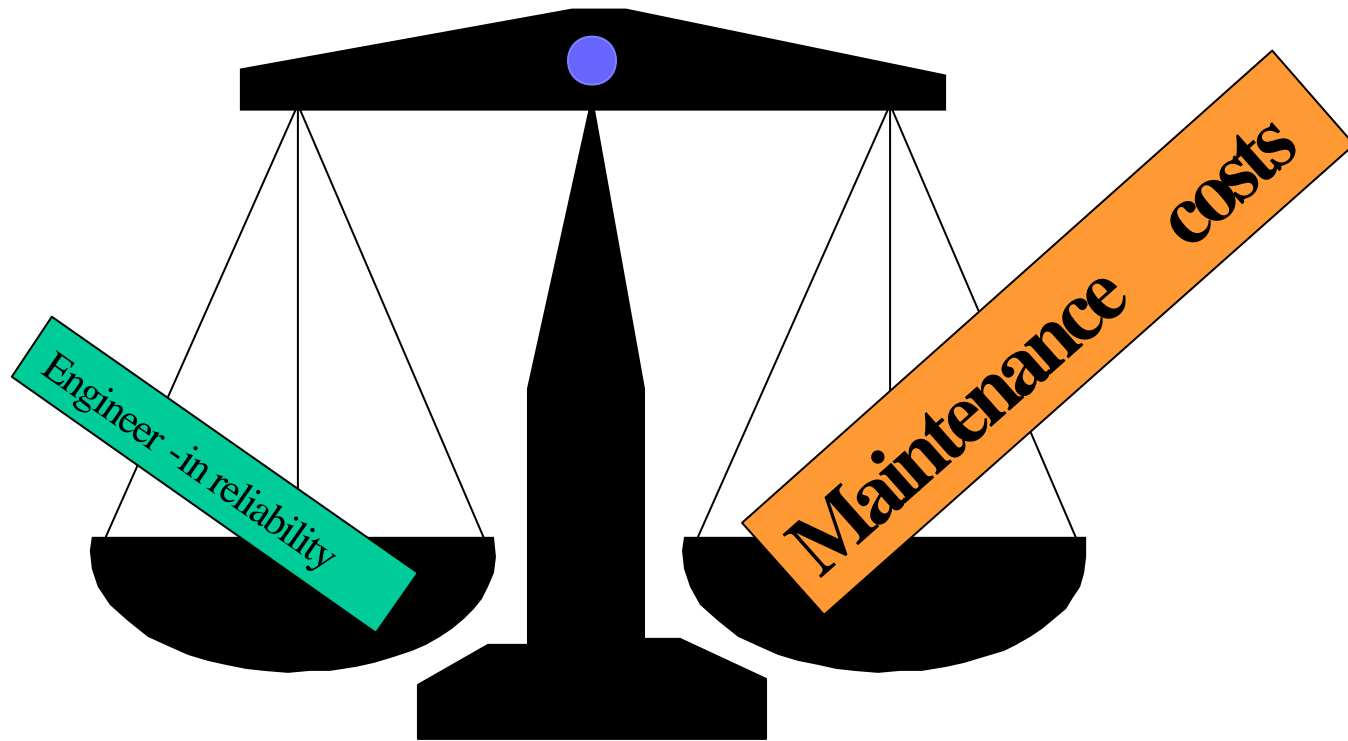
Therefore:

about 500 detectors and 10 junction boxes / year will fail

cost of maintenance ??????????

system partially down ? May be acceptable?

What's the reliability vs maintenance balance ?



Cost of getting the balance wrong

Alcatel

- Damages paid to customer
- High cost of repair
- Loss of customer confidence
- Company does not win the next contract
- Profits and share price hit
- Restructuring!
- I need to find a new job

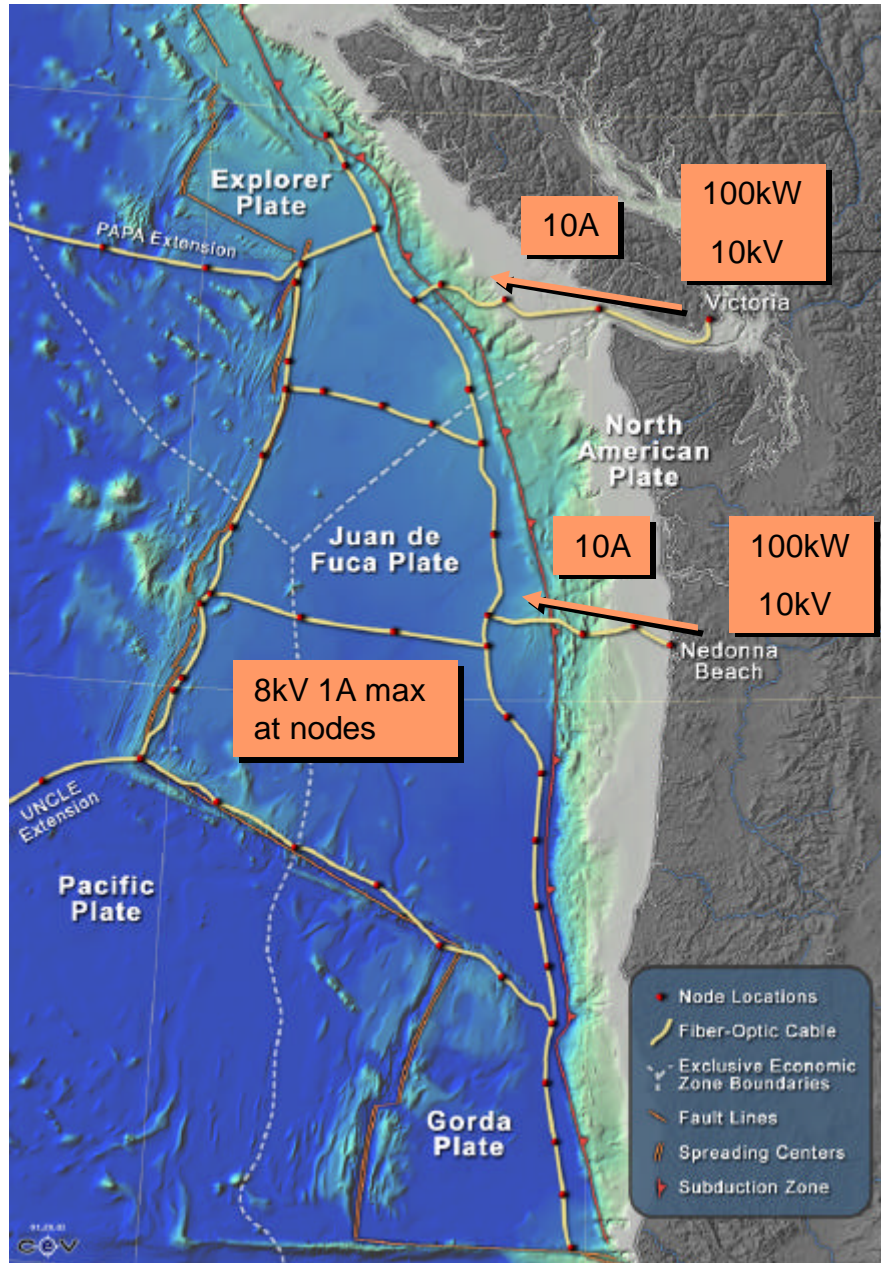
NEPTUNE

- Don't get data back
- Can't write papers
- Loss of reputation in science community
- Loss of confidence by sponsor
- No more funds
- Can't support costs
- Project ends

Remember GEC?

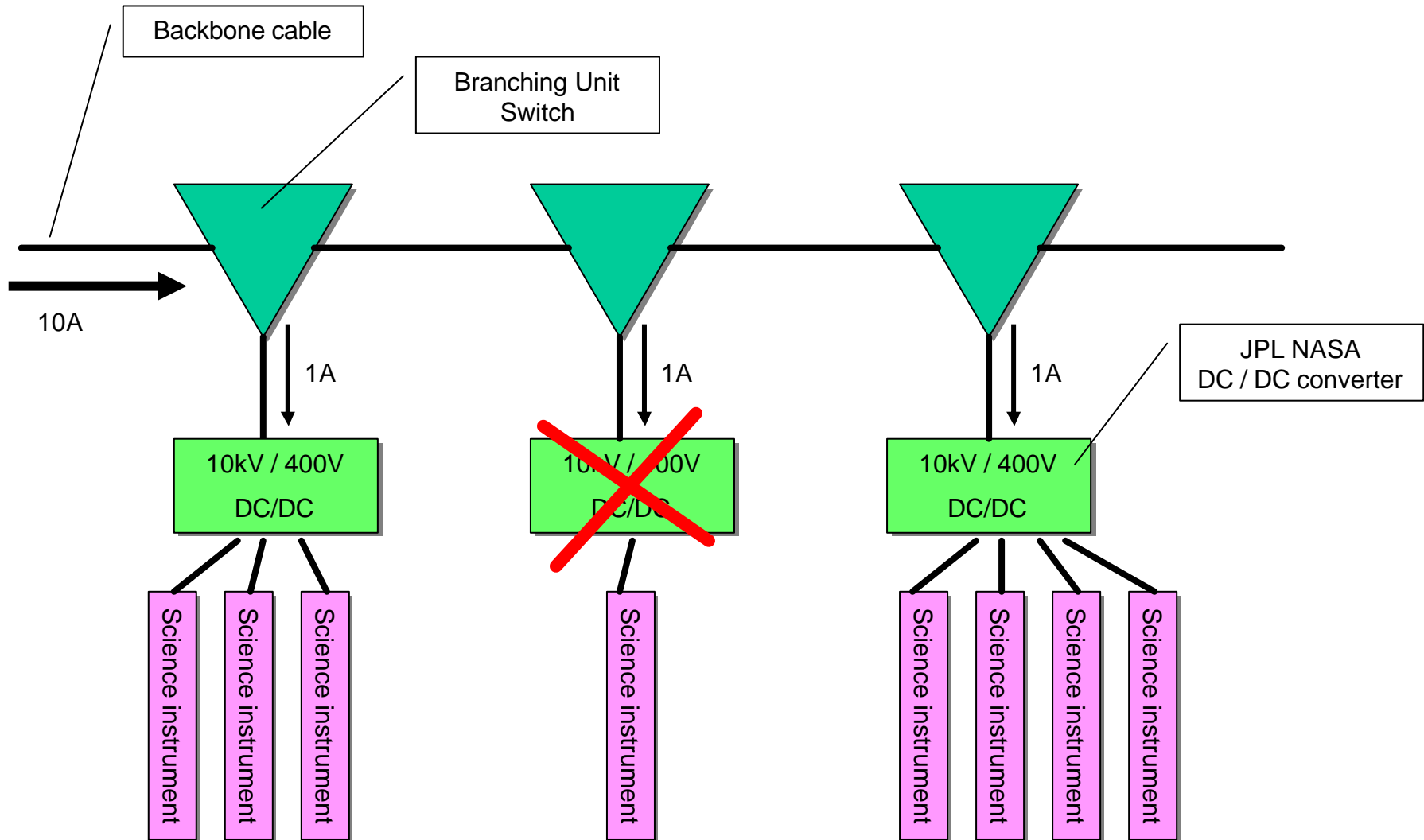
Remember DUMAND?

Power system implementation

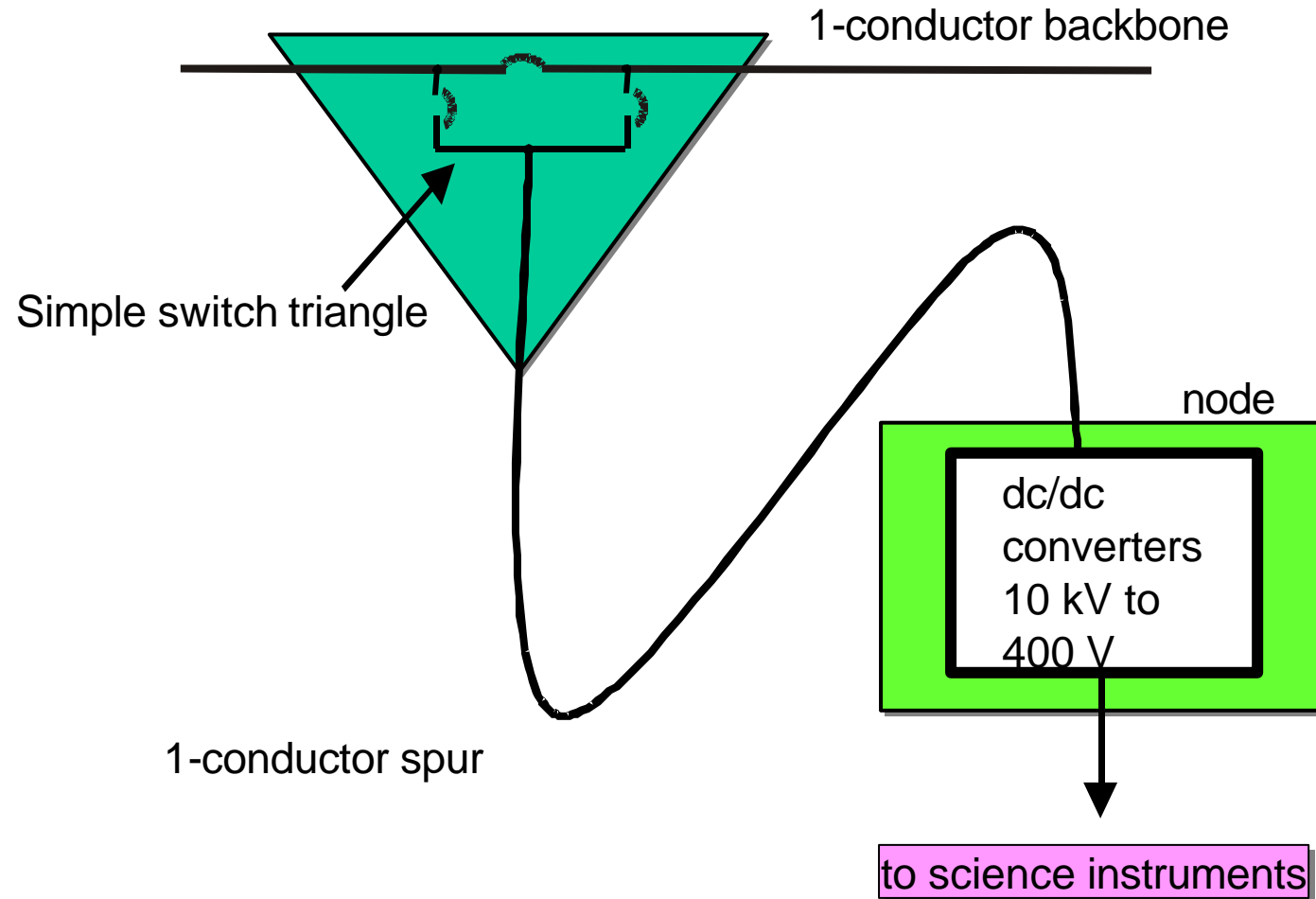


- 100kW power supply at 2 locations
- 10kV 10A DC
- 8kV 1A max at node

Power system implementation



Power system implementation



SUMMARY

The three *Rs* of a successful project:

- **Requirements**
 - Fix top-level requirements early
- **Responsibilities**
 - Need strong capable leadership
 - Need system engineer
 - Accept overhead costs and discipline
- **Reliability**
 - Must be designed-in from the beginning
 - Consider acceptable post-deployment costs

Some questions for you

- **Requirements**

- How well is your mission defined?
 - Are you contemplating expansion?
 - What are your maintenance options?
 - How much can you afford?
- What science alternatives are considered?

- **Responsibilities**

- How will you divide the work?
- Who will manage?

- **Reliability**

- Who in your collaboration can lead in reliability?