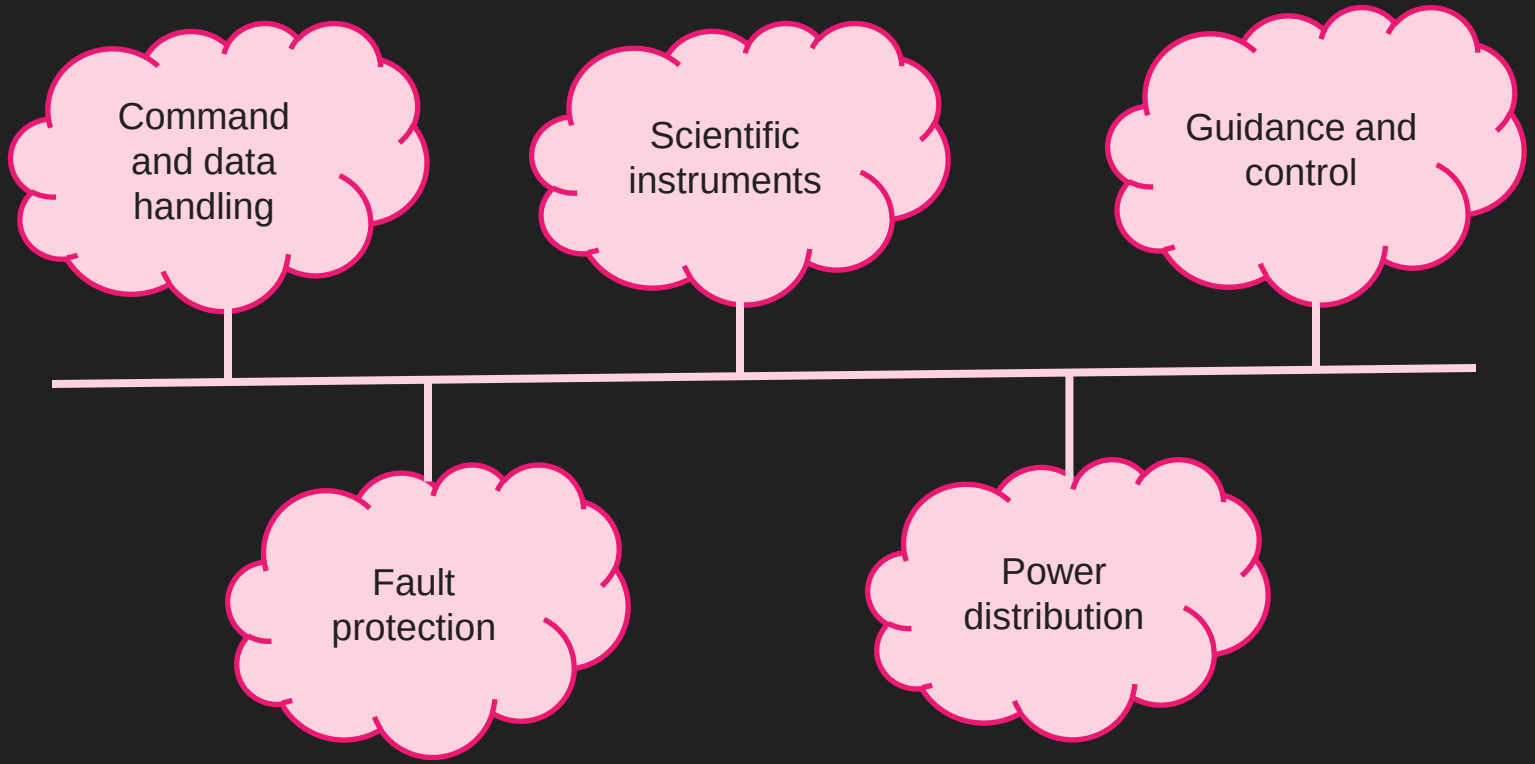
Code in Spaaaaaaace!!!!!!

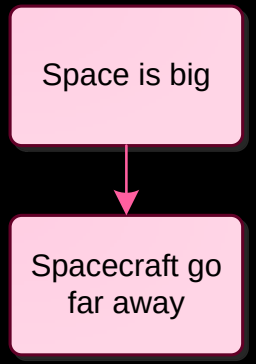
Katie Bechtold

!!Con
2016 May 7

A spacecraft is a network of embedded computers



Space is big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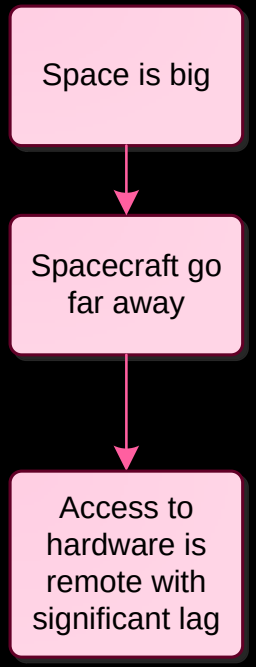
Spacecraft go far away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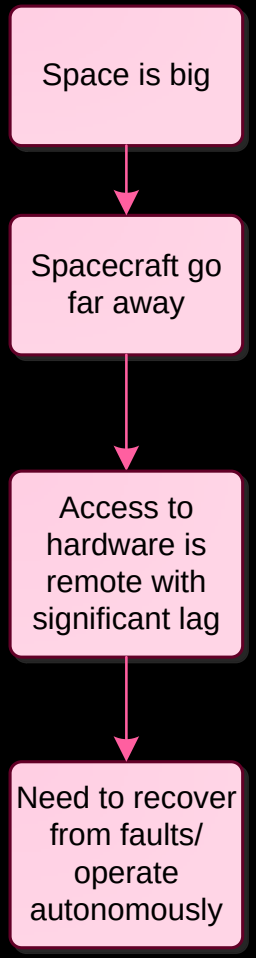
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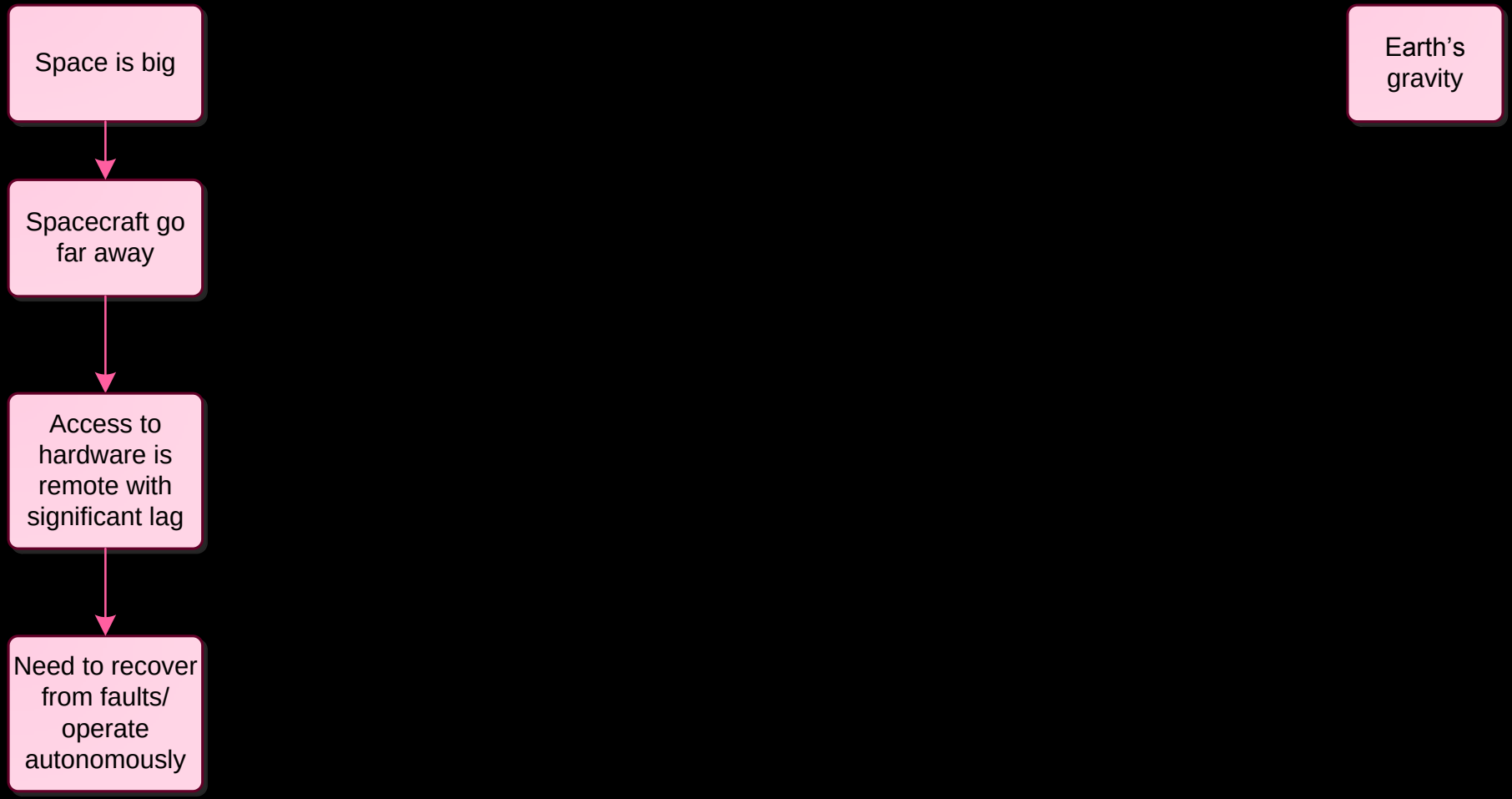
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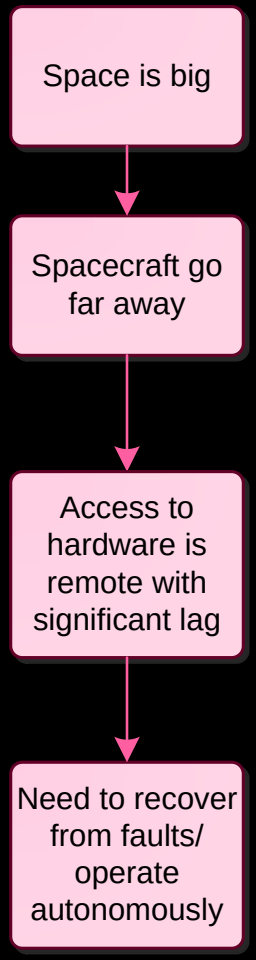
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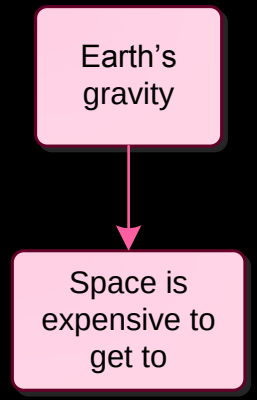
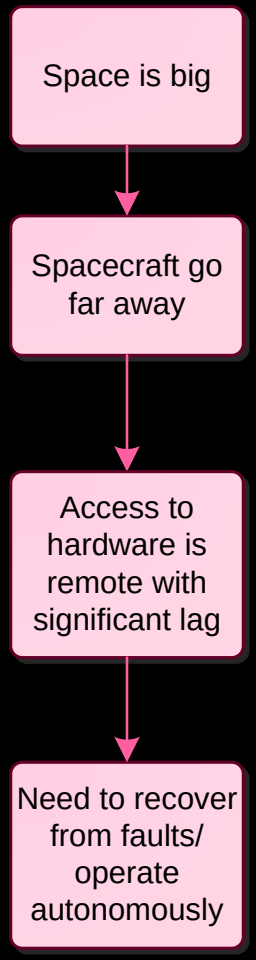

Earth’s gravity
Space is expensive to get to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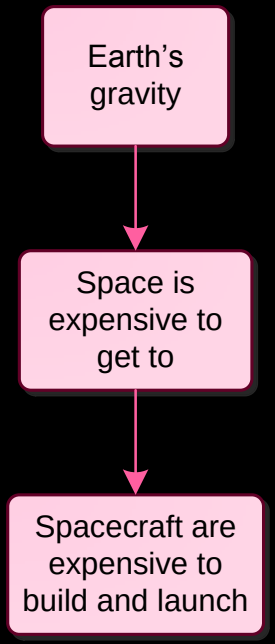
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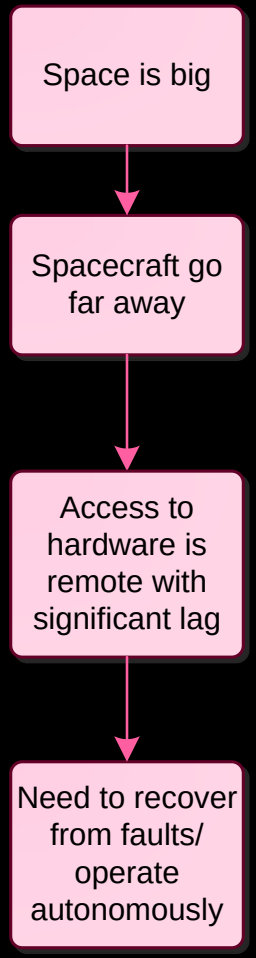
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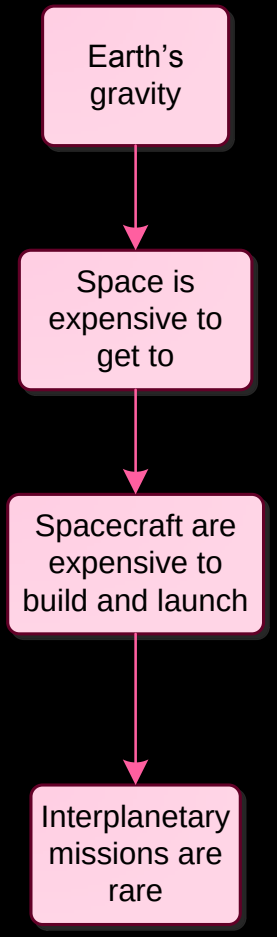
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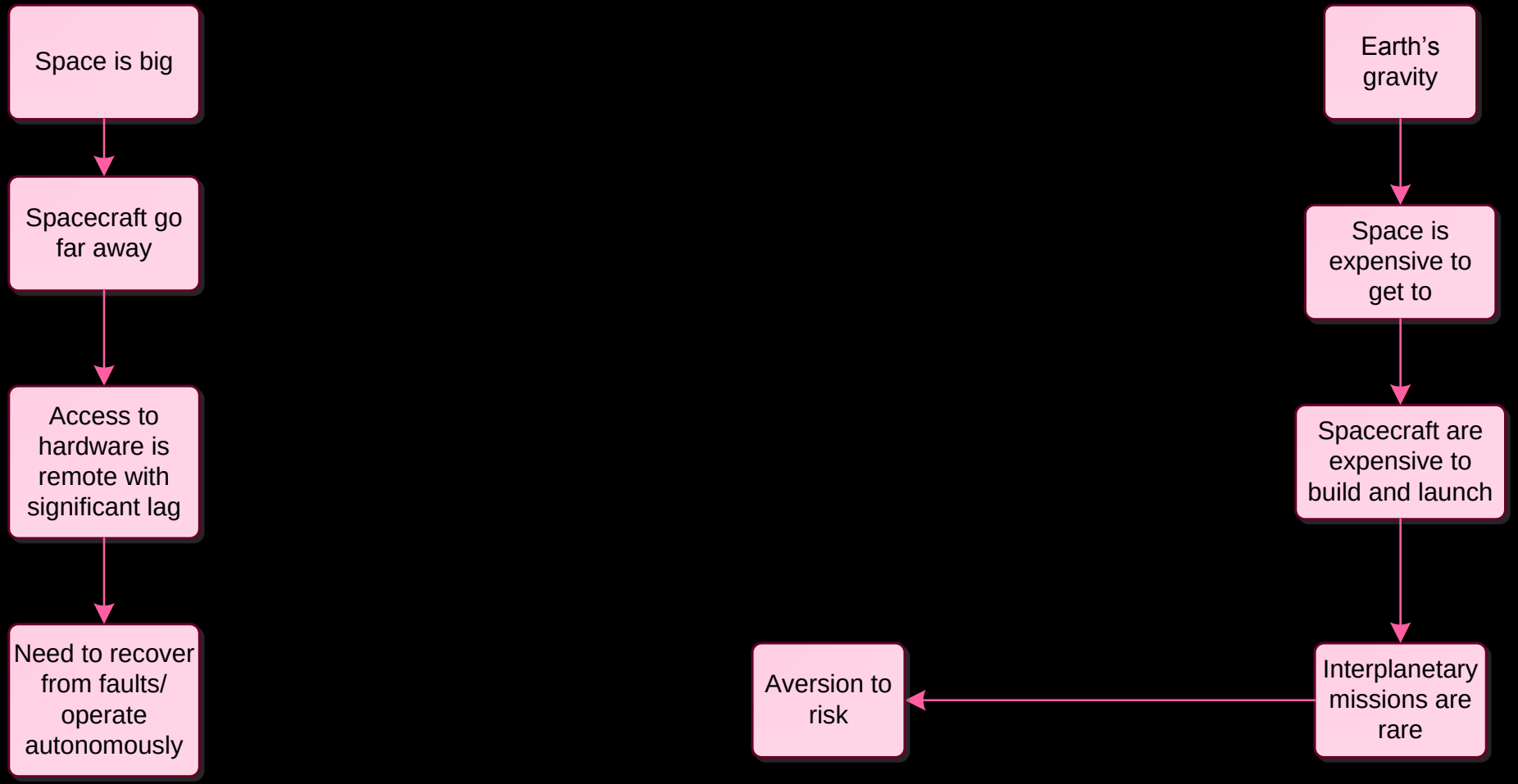
Space is expensive to get to
Spacecraft are expensive to build and launch
Interplanetary missions are rare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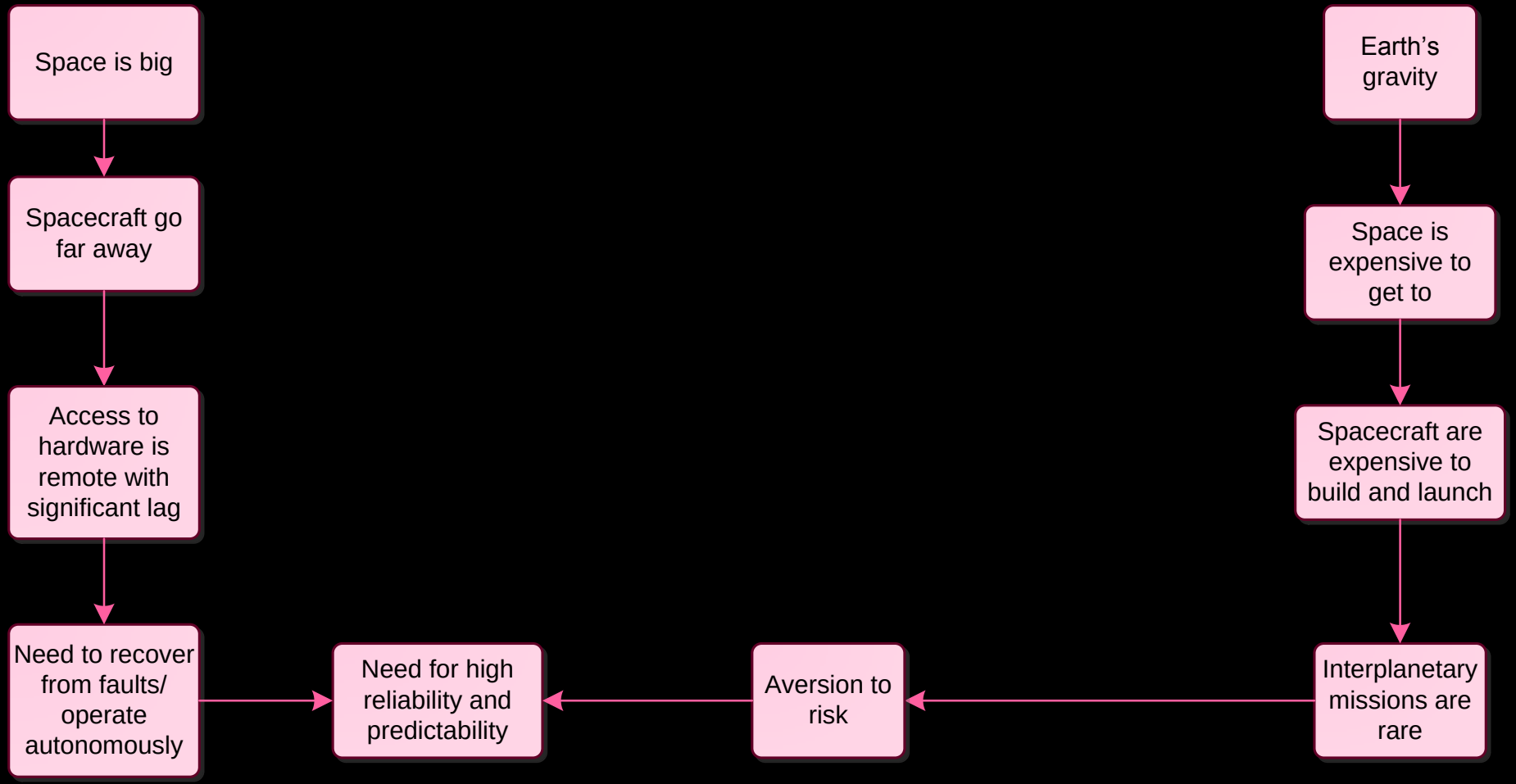
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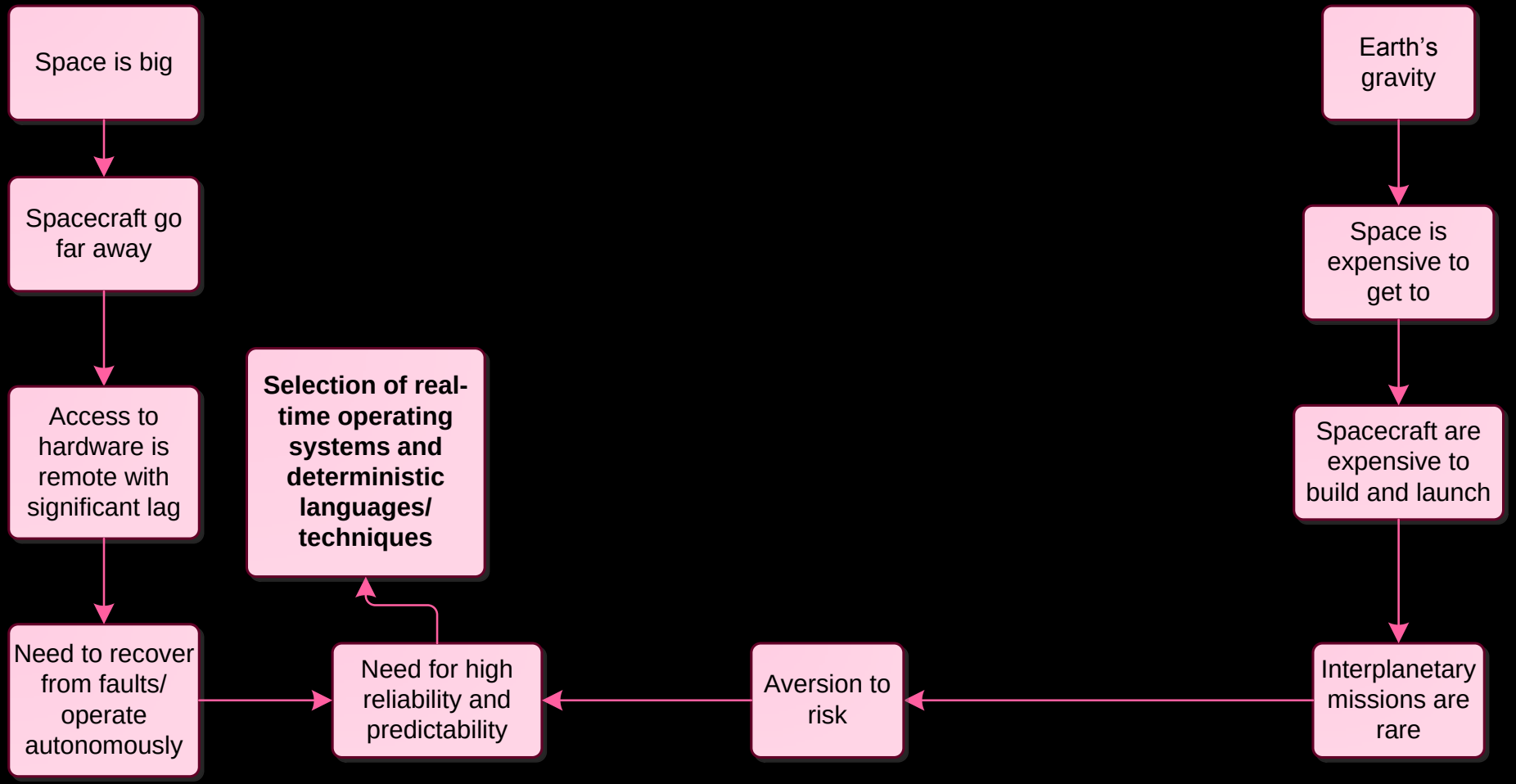
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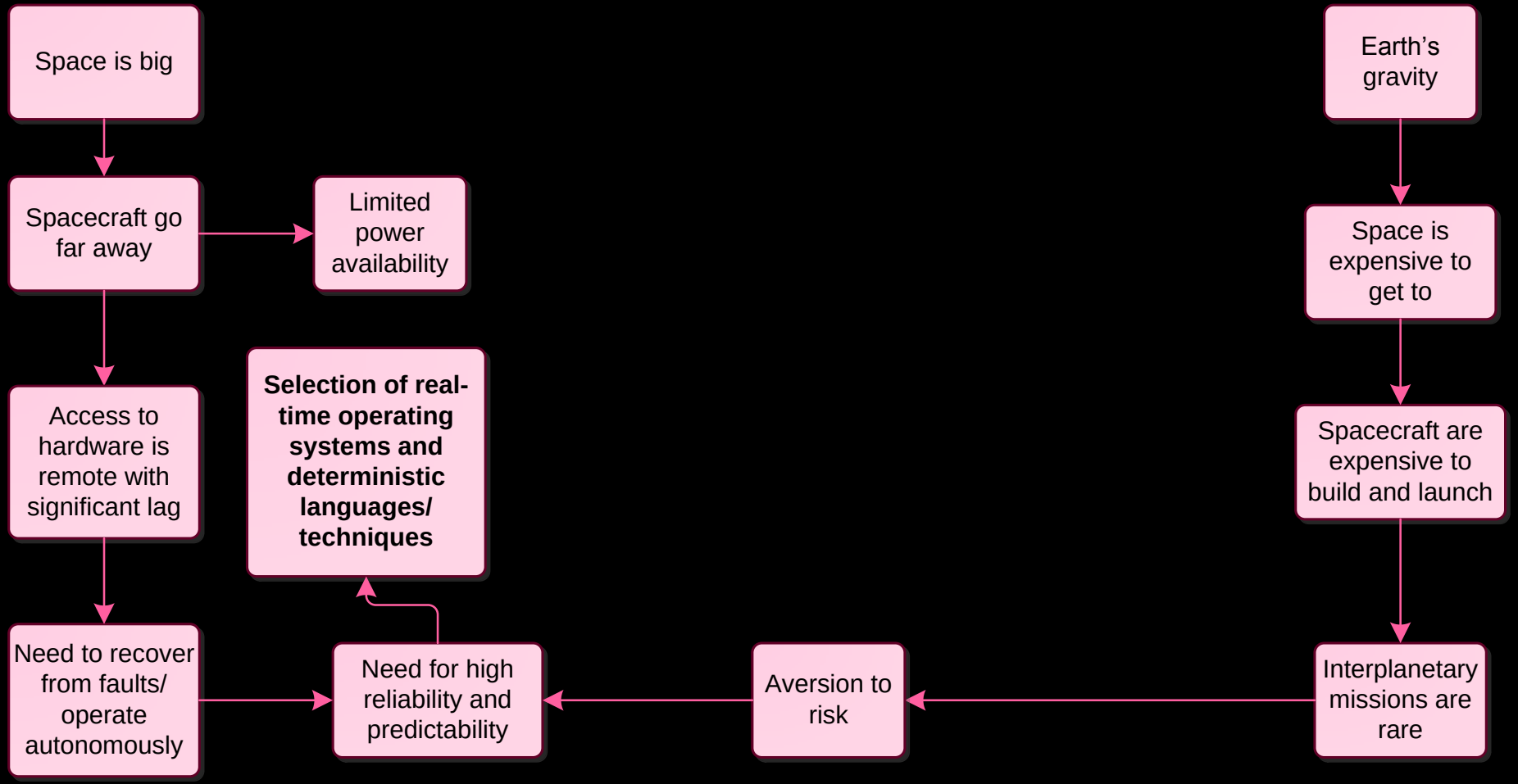
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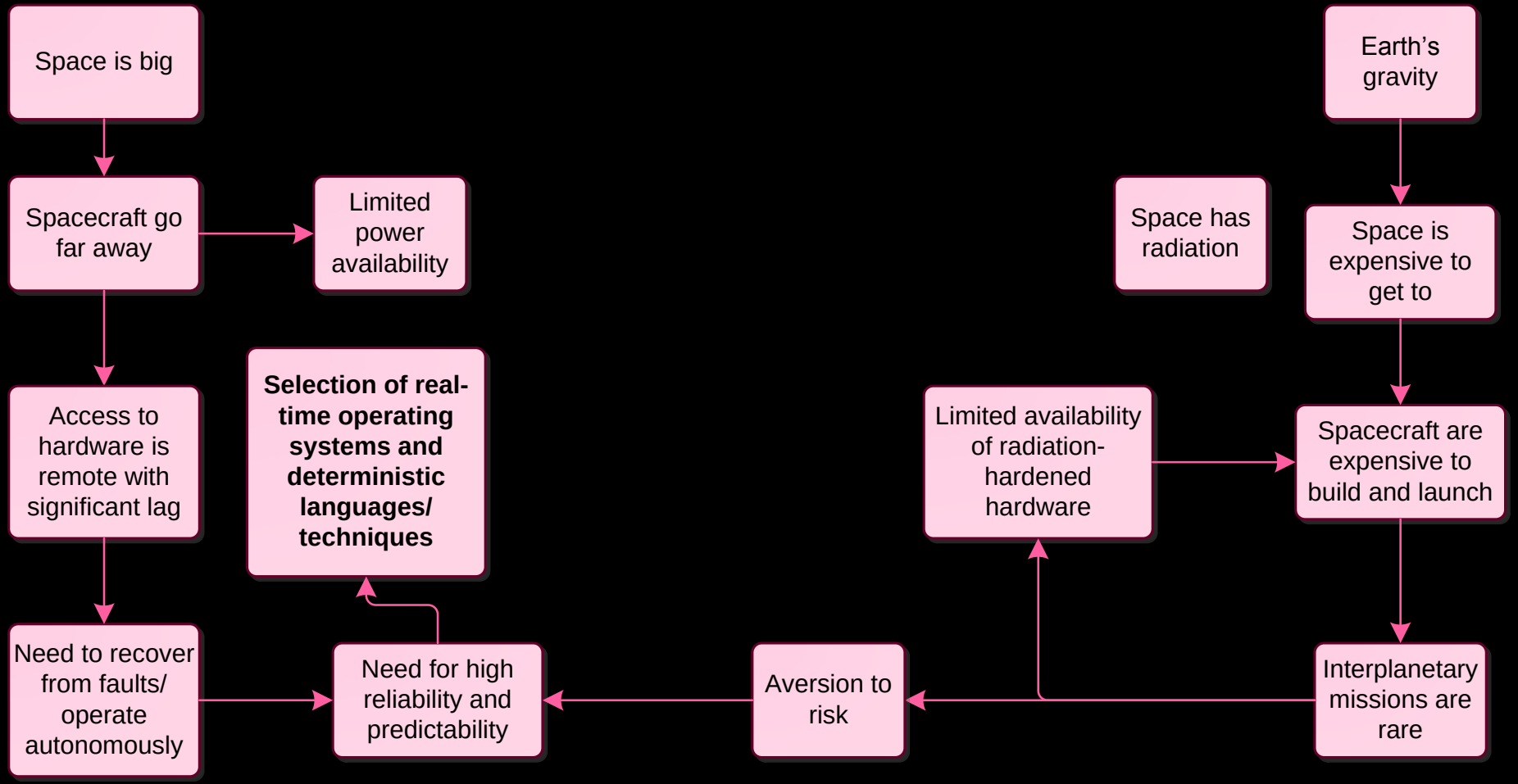
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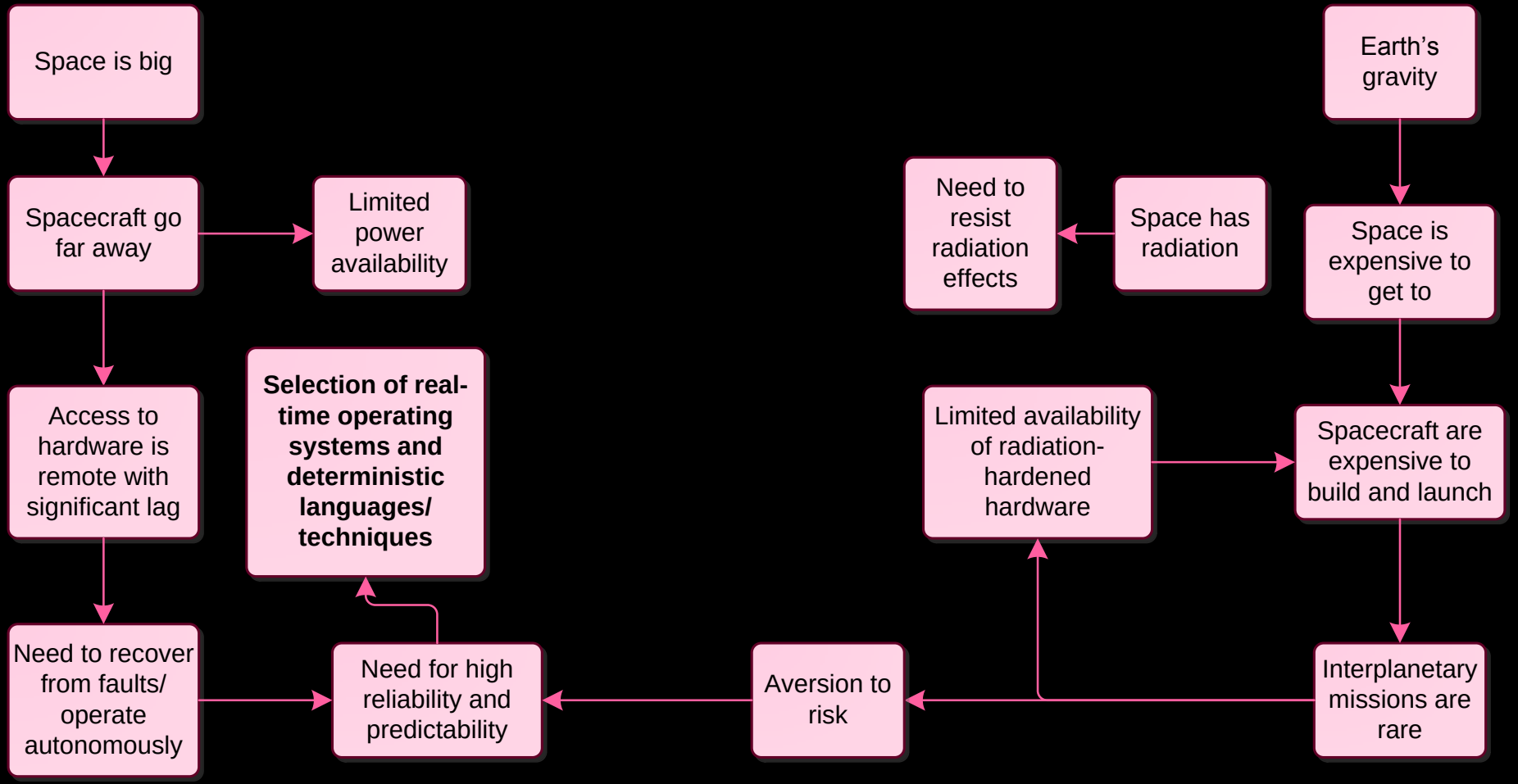
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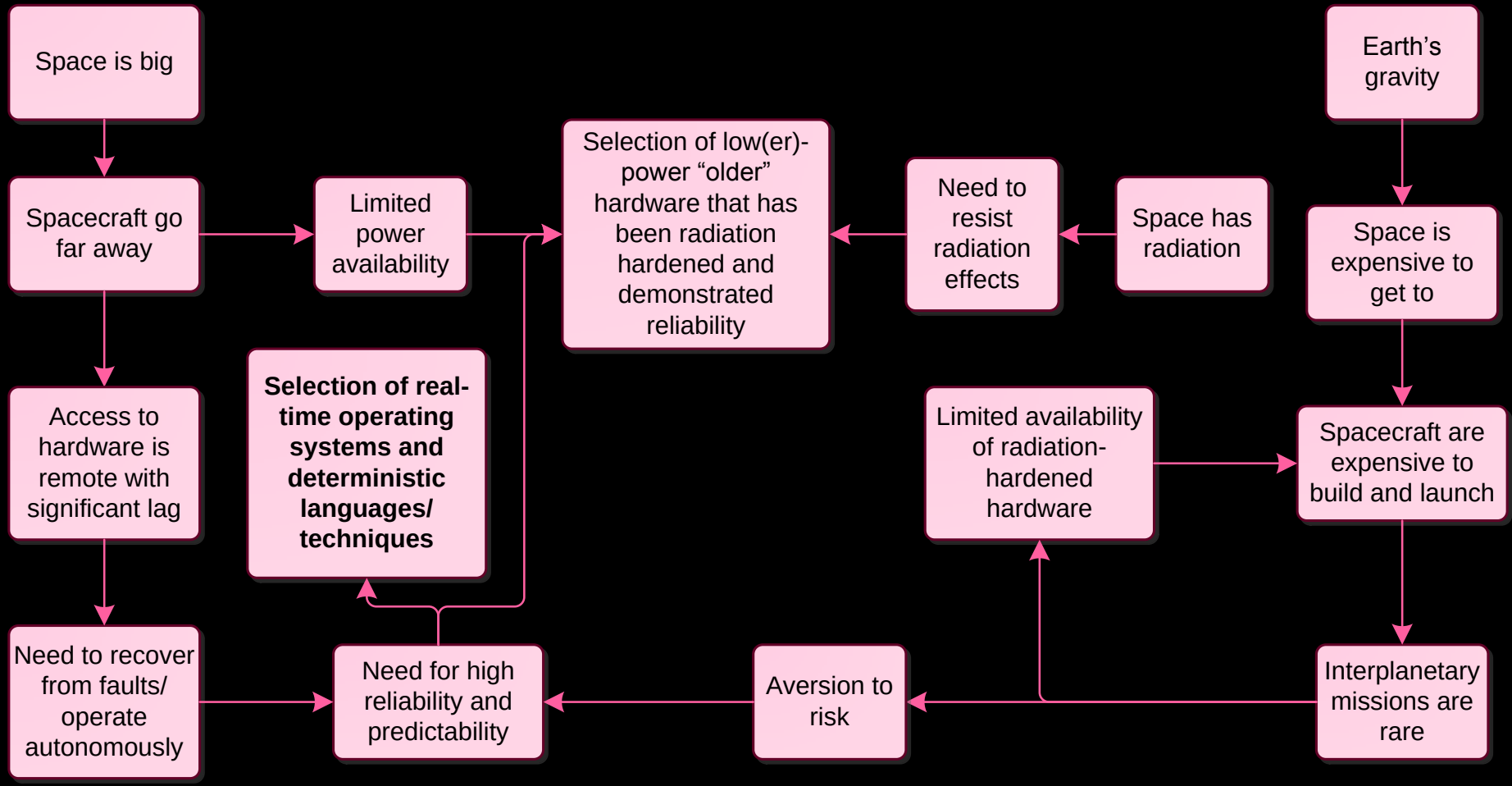
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Selection of real-time operating systems and deterministic languages/ techniques
Need for high reliability and predictability
Selection of low(er)-power “older” hardware that has been radiation hardened and demonstrated reliability
Need to resist radiation effects
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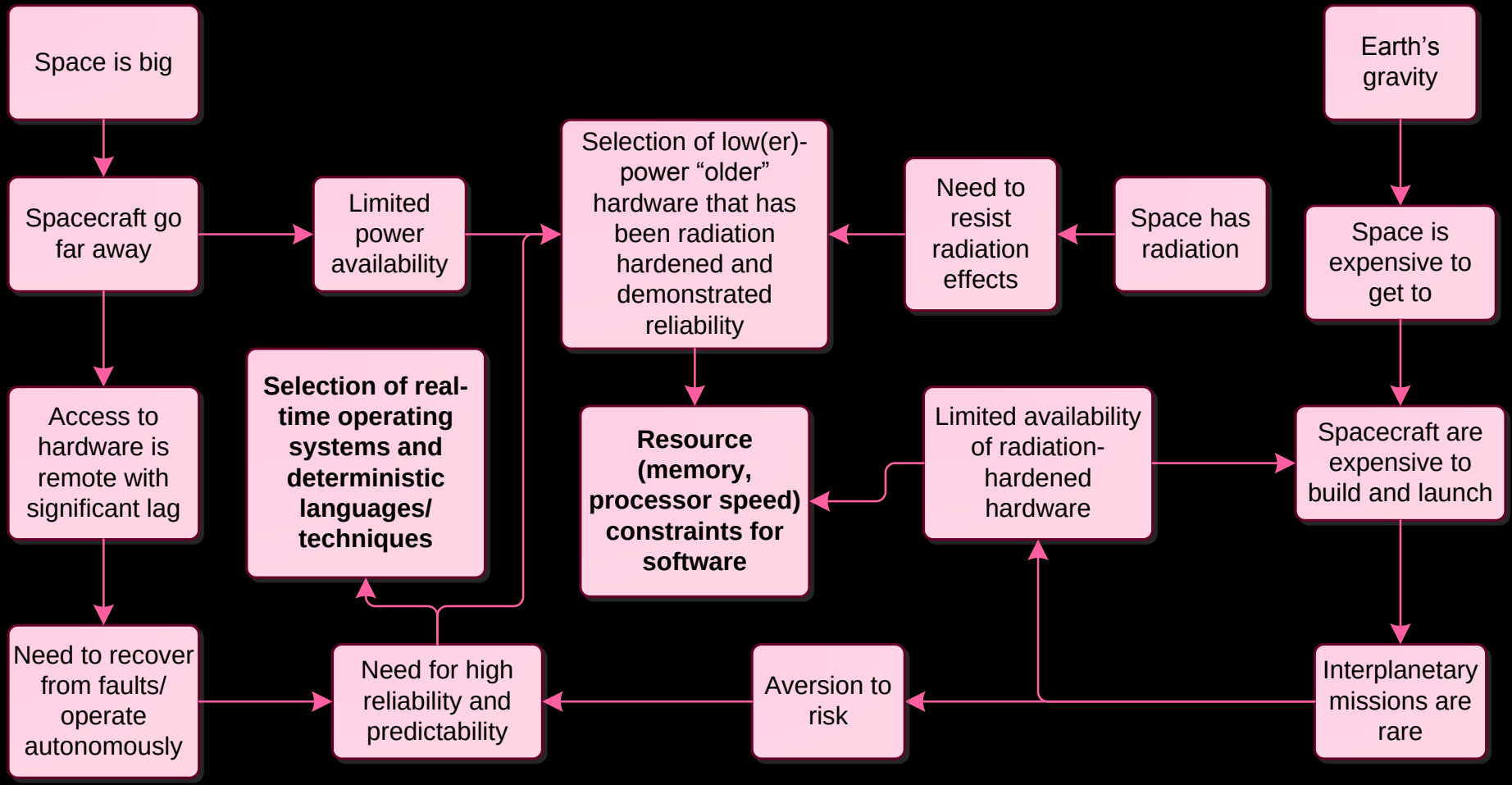
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Selection of low(er)-power “older” hardware that has been radiation hardened and demonstrated reliability
Resource (memory, processor speed) constraints for software
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	Voyagers	New Horizons	Solar Probe Plus
Year launched	1977	2006	2018
Main processor	Various integrated circuit chips	Mongoose-V	UT699E
Main processor speed	250 KHz / 0.008 MIPS	12MHz / 8 DMIPS	80MHz / 112 DMIPS
Memory	~70 KB	16 MiB	8 MB MRAM (NVM), 32 MB RAM
Mass Storage	67 MB digital tape recorder	2 x 8 GB SSRs	32 GB SSR
Operating System	none	Nucleus RTOS	RTEMS

The future

Open source tools and operating systems

Libraries and re-use

Core Flight System