



Fundamentals of RBD

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Reliability Goal



System Goal



Sub-system Goal



Component Goals?

RBD Uses



Make Decisions



Identify Weaknesses



Tradeoff Analysis

Make Decisions



A model helps us to understand a complex system

Understanding leads to better decisions

We need to decide:
what to improve,
where to spend resources,
and which options to pursue.

'..some models are useful.'



**What else can
a reliability
model help us
decide?**

Identify Weaknesses



A robust product is a reliable product

We need to improve the areas that will fail first

We need to organize reliability data across functional areas

How do you
spot
reliability
weaknesses?



Tradeoff Analysis



Center.... come to balance

Cost vs reliability

Time to market vs reliability

Feature set vs reliability

How is
reliability
balanced in
or your
organization
today?



How are these
models wrong?

Basic RBD



Series



Parallel



Complex

Series RBD



Weakest link model

Series system

Multiply Reliabilities

Most Common

```
graph TD; R_system[R_system] --- And((And)); And --- R1[R1]; And --- R2[R2]; And --- R3[R3]; And --- R4[R4]; And --- R5[R5];
```

R_{system}

And

R_1

R_2

R_3

R_4

R_5



The diagram is set against a background map of the Pacific Ocean and surrounding landmasses. It features a horizontal line with five blue rectangular blocks labeled R_1 , R_2 , R_3 , R_4 , and R_5 in sequence. Above the middle block R_3 is a larger blue rectangular block labeled R_{system} .

R_{system}

R_1

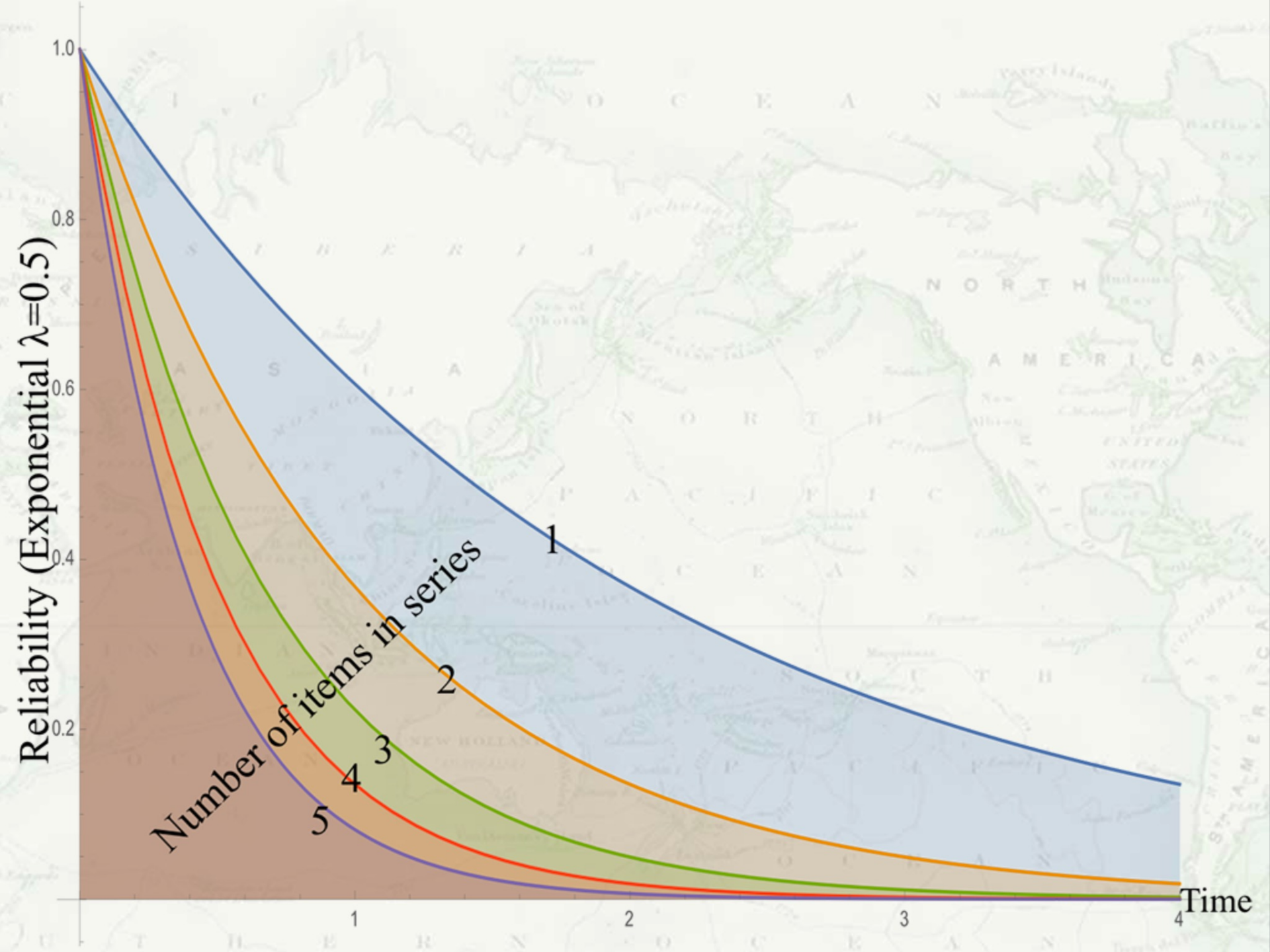
R_2

R_3

R_4

R_5

$$R_{\text{system}} = \prod R_i$$



Parallel RBD

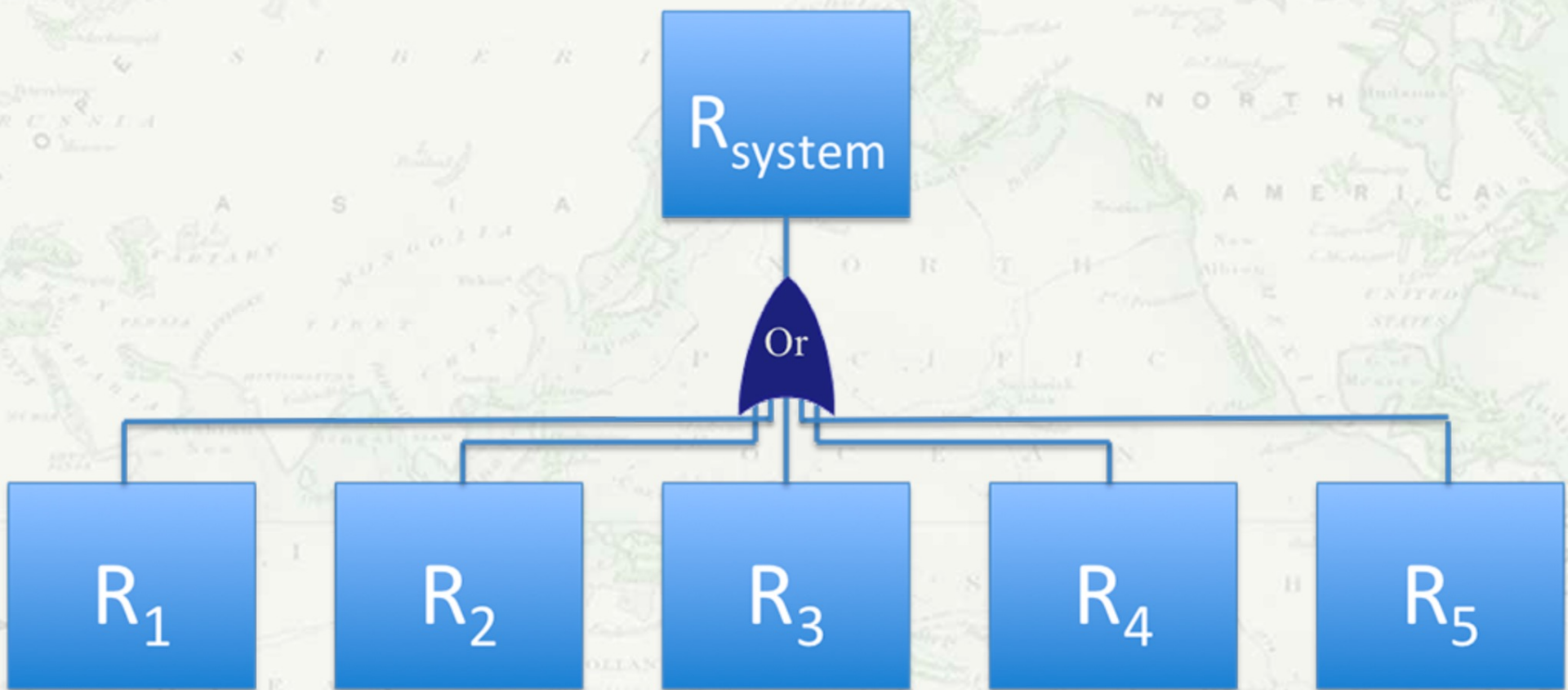


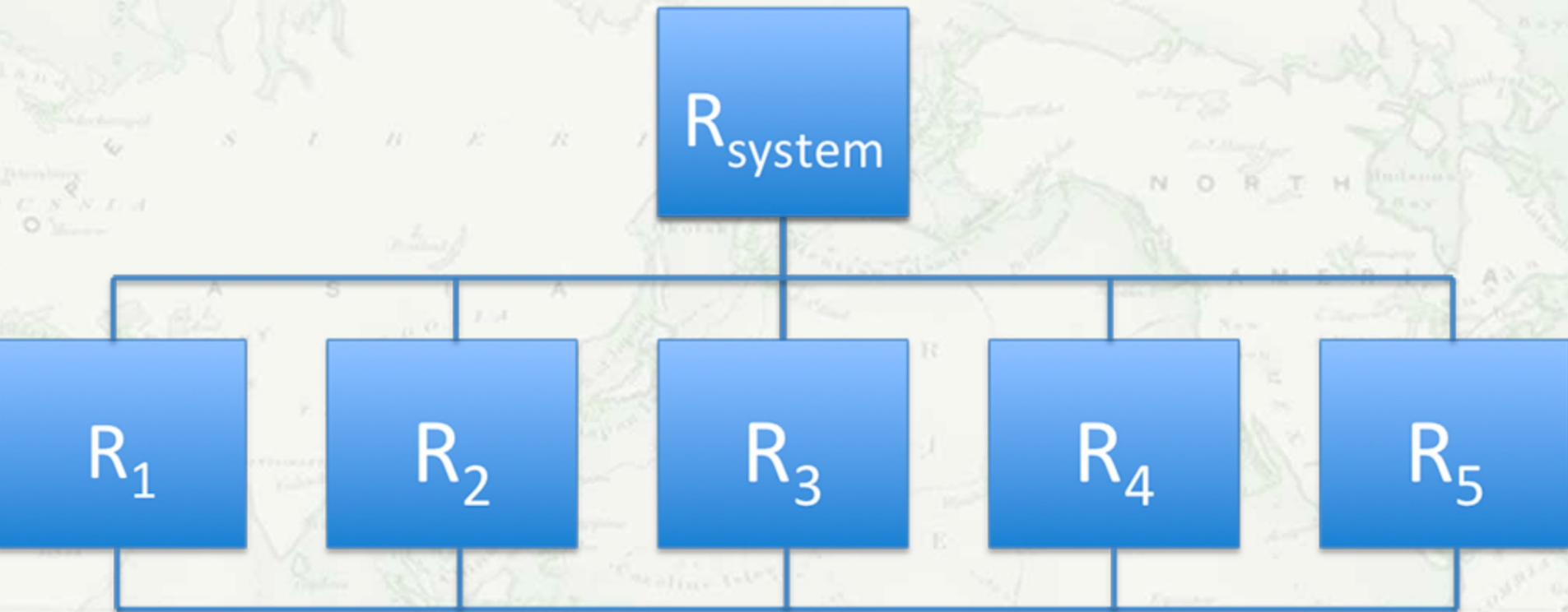
Add complexity

Redundancy model

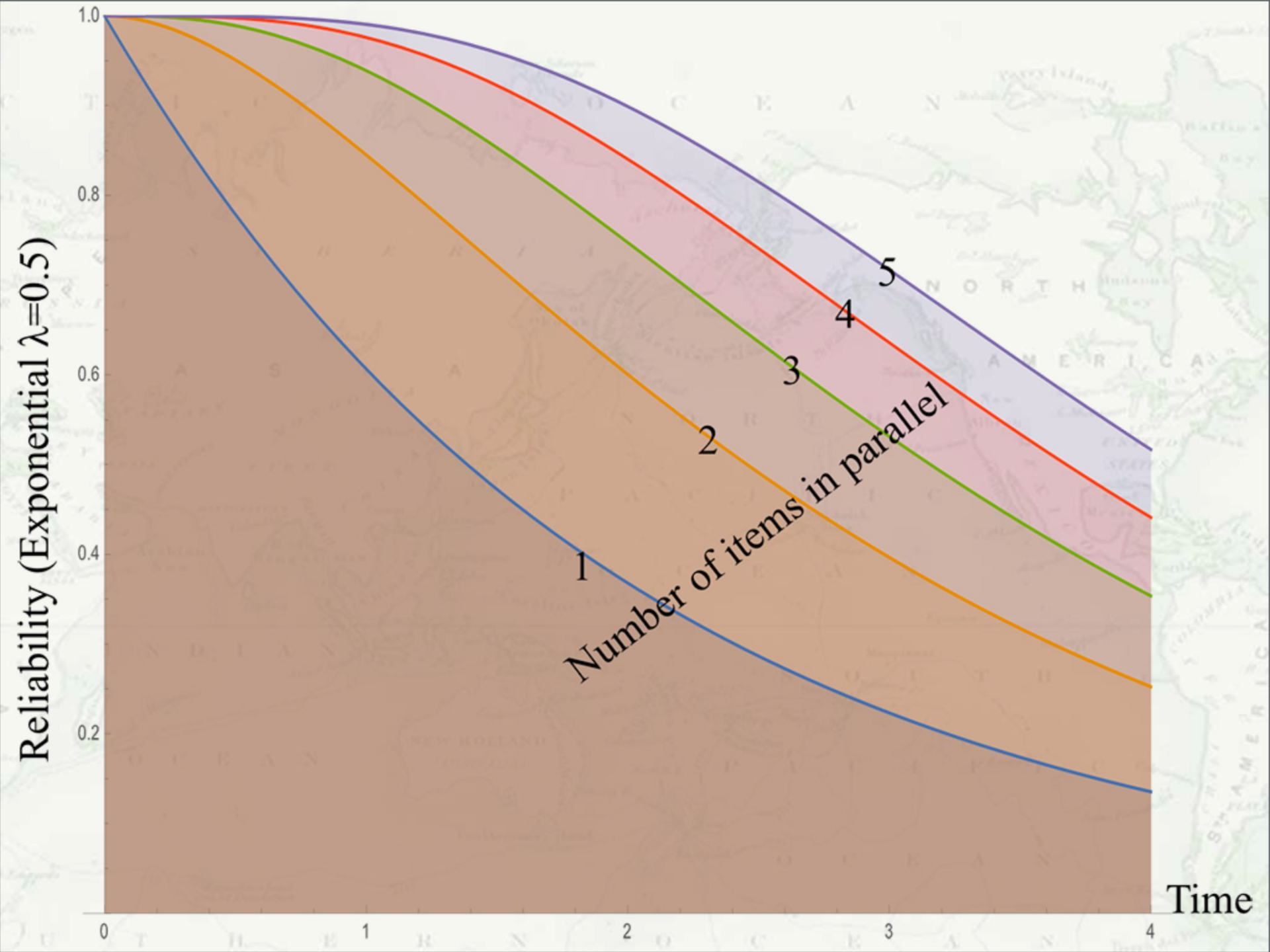
Basic model has
perfect switching
load sharing

Many variations
imperfect switching
cold or warm standby
etc.





$$R_{system} = 1 - \prod (1 - R_i)$$



Complex RBD

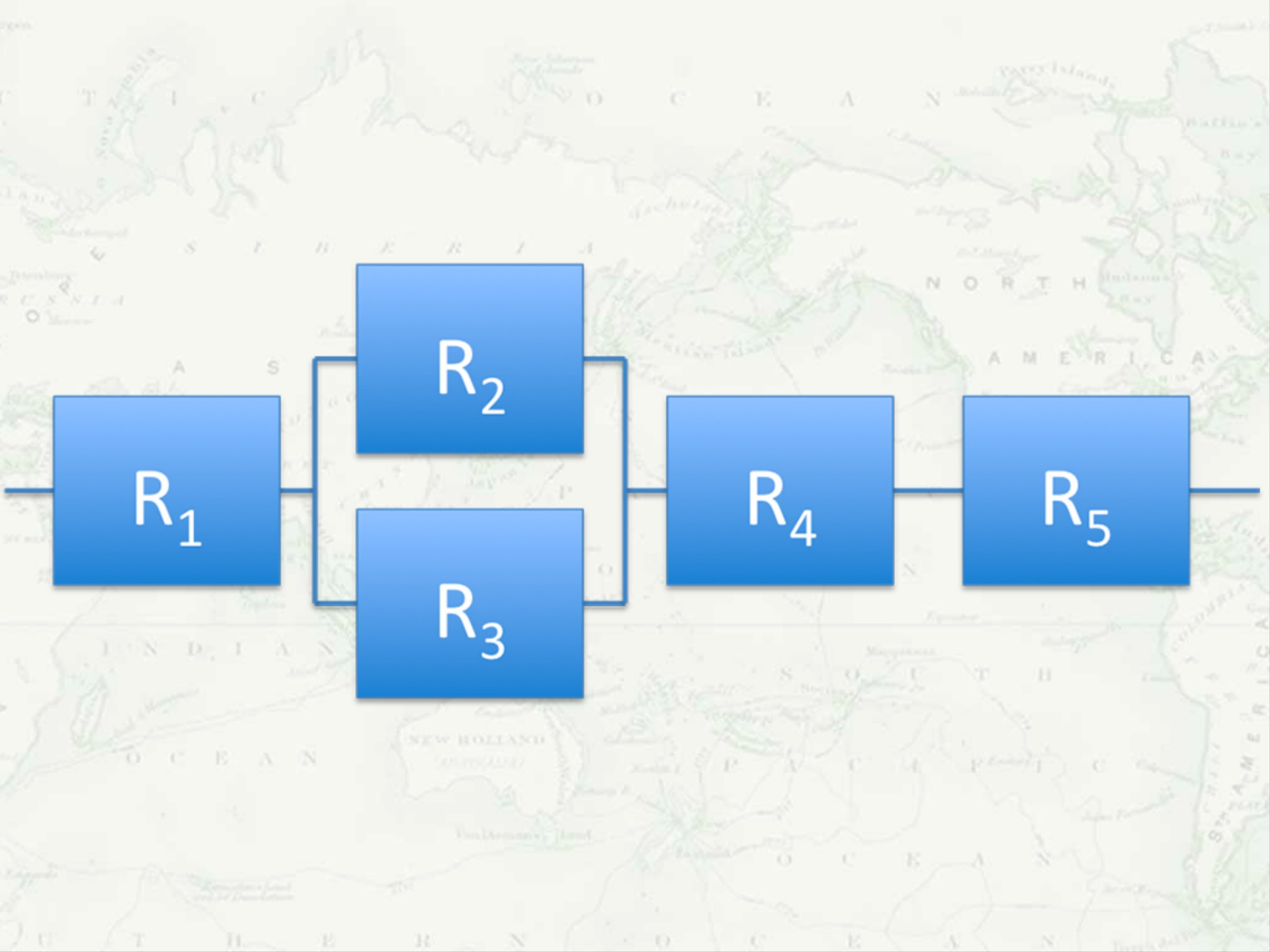


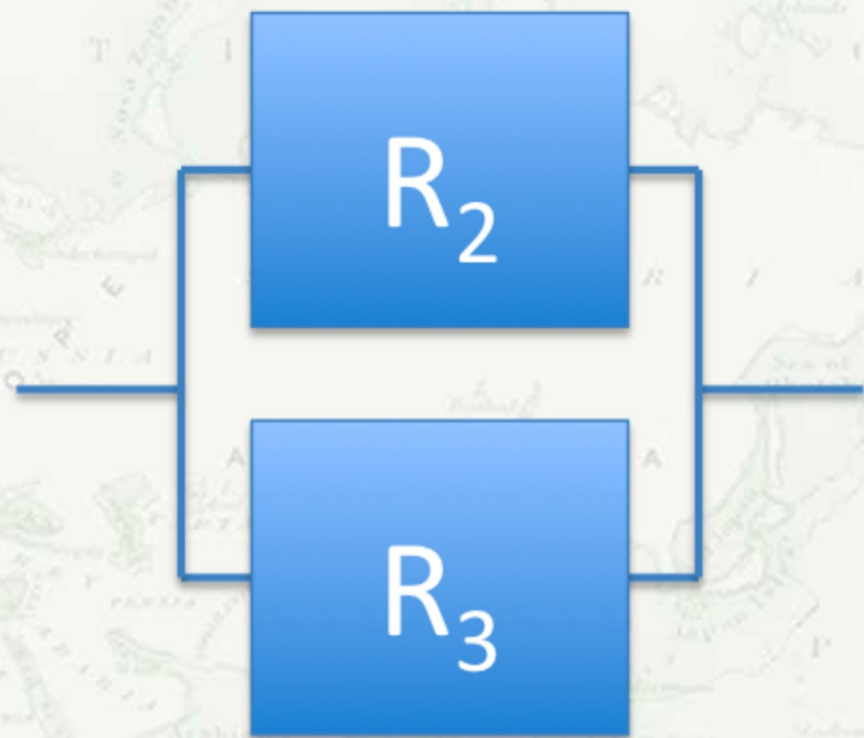
A mix of series and parallel

A not too complex model

Mixture of series and parallel elements

There are other more complex models
Keystone structure, for example





$$R_{2\&3} = 1 - \prod (1 - R_i)$$

R_1

$R_{2\&3}$

R_4

R_5

$$R_{system} = \prod R_i$$

How well are your
RBDs working?

A Basic RBD Story



Must Improve Reliability



Initial Estimates



Team Tracking

**Market
Share
Customer
Satisfaction
Revenue
Reliability**



Very Basic
Initial
Model

Little
more than
guesses



**Weakest
Link**

**Options
& Focus**

Decisions



How have you
enjoyed success with

RBDs?

Even a Simple RBD Creates Value

System & Apportioned
Reliability Goals
-fully stated



RBD with initial
reliability estimates



Use to focus decision
making and resource
allocation

More Information

Visit AccendoReliability.com

Let me know if you have any questions.

Check out the reliability engineering podcast network at Reliability.FM

Continue to explore your testing and make improvements.