



Planning for the Next Generation

Dawn 3

Expanding our Vision

- It is time to rethink and refine our ideas about the next generation of ground-based gravitational wave detectors
- Coordinated through GWIC, we are preparing to update our understanding of 3G
 - the science we can do
 - the technology we have available
 - and the power of a network based approach

Cosmic Explorer

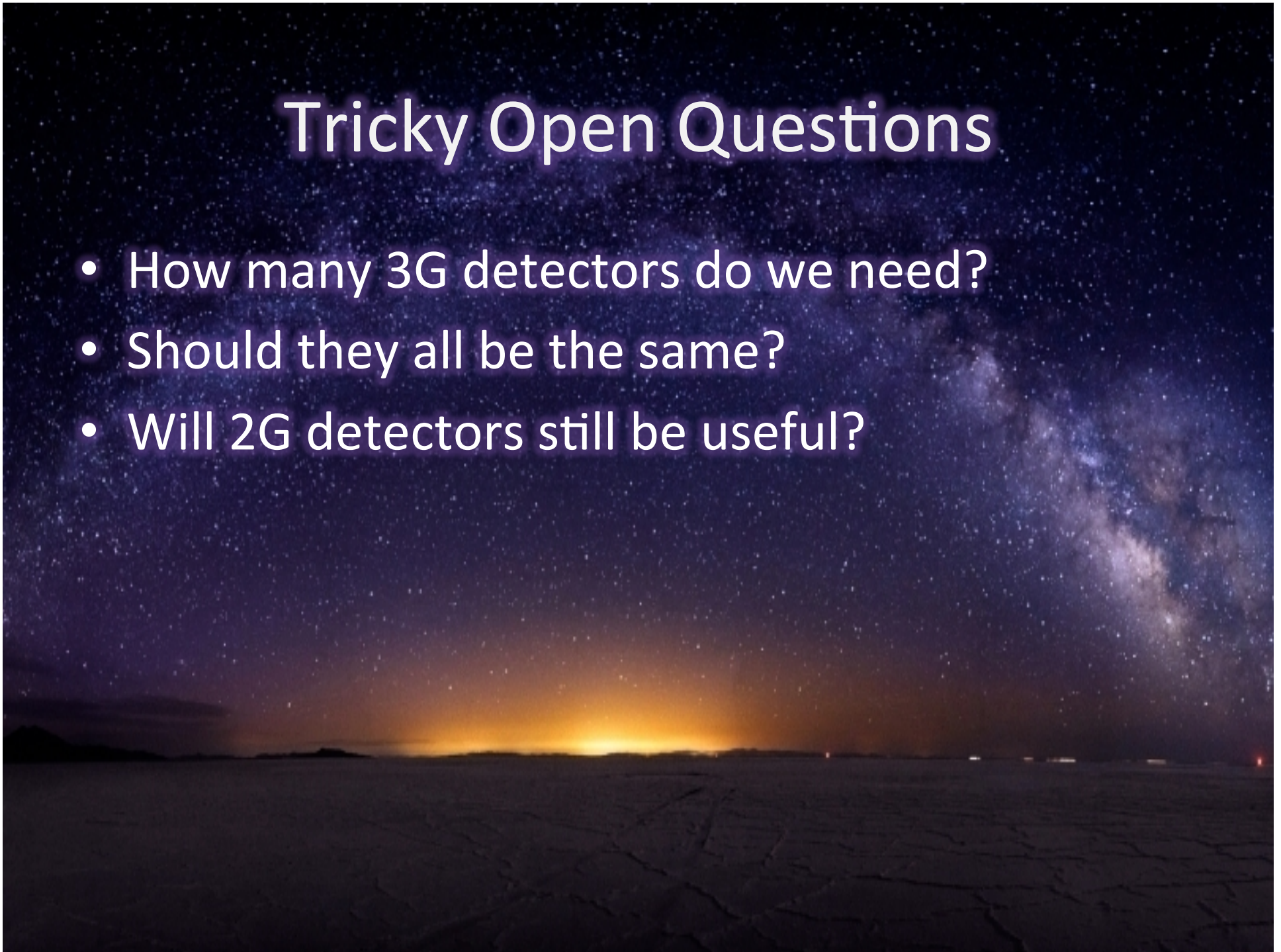
- The US contribution to the design of a future ground-based 3G network is taking shape
- Cosmic Explorer is a new look at what can be done with a ground-based interferometer
 - unlike the Einstein Telescope, the focus of this study is on an above ground facility which houses a single interferometer

Astronomical Excitement about 3G

- Recent LSC paper about CE has already been cited 14 times
 - tests of GR and alternate theories of gravity with black hole binaries
 - exploration of neutron star equation of state
 - astrophysical “backgrounds” from BBH and BNS
 - parameter estimation with 3G networks
 - ...
 - but there are holes and we lack a coherent picture

Tricky Open Questions

- How many 3G detectors do we need?
- Should they all be the same?
- Will 2G detectors still be useful?



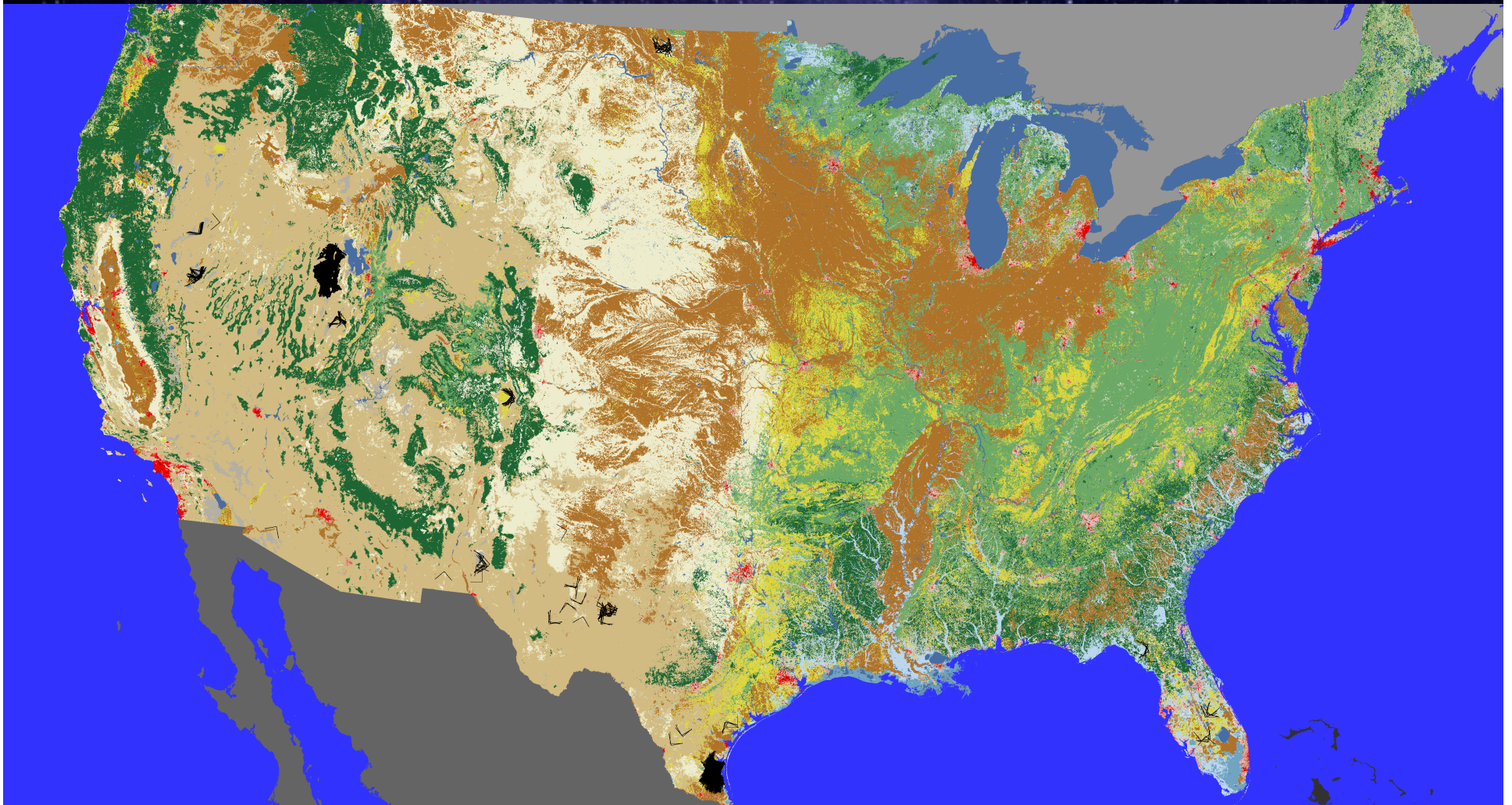
Answer: “It Depends”

- Good localization of the majority of detectable sources, for example, requires at least 3 detectors of comparable sensitivity
 - but do we need to localize the **majority**?
 - maybe EM counterparts are only available for low red-shift events, which will be the minority
 - maybe there are enough events that we can afford to cherry-pick the best ones

Is 40km necessary? Optimal?

- This is part of the 3G science case work
- We will search for the best science per dollar design
- There is no attachment to 40km, though first indications are that it is not far from optimal

Is 40km possible?



Is 40km possible?



Is 40km possible?



Other Questions

- L or triangle shape?
- above ground or underground?
 - we will leverage the significant work that went into the ET conceptual design study to answer many such questions
- How much will this cost?
 - we need professional studies, combined with LIGO lab experience, to make a reliable estimate of facility construction cost (similar to what has been done and is happening now for ET)

Now is the time to move forward

- Excitement for 3G is high, so there are many interested parties thinking about 3G science
- The lead-time on new facilities is long (>15y)
- Proposal to NSF for CE conceptual development will be submitted this year
- Work will be coordinated within the LSC, and with international partners in Europe and Australia through GWIC and GWAC

The Message

- An international 3G network has huge science potential
 - The details of how to best realize the science potential are still not known
- Many studies from broader community are available, or will be soon
 - we need to put them together, and fill some holes, to form a coherent picture
 - (dedicated effort required)
- It is time for a real cost estimate for CE