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Exoplanet Ephemeris Maintenance using Ground- and Space-based Telescopes

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Ariel will require precise knowledge of the transit timings for all of its targets. However, the precision we have for each target will degrade significantly over the 8 years until launch, in some cases to the point where the error exceeds the duration of the transit itself. The knowledge of these transits would then be deemed "lost". To counteract this, and in effect "reset the clock", we aim to use the Telescope Live network of robotic telescopes to observe such targets. With 1000 targets and an average orbital period of the order of days, the size and usage of the network required needs to be quantified. Here we present results from simulations of these observations for a variety of telescope networks of varying sizes, the number of targets that can be successfully constrained, and the amount of observing time required to do so. From these results we can conclude that a ground-based telescope network containing as few as 2 telescopes of 0.6m aperture can constrain over 60% of the targets with transit depths observable from the ground. A fraction of these exoplanets are difficult to observe with ground-based telescopes as they either have transit depths too shallow to detect due to atmospheric distortion and/or their transit durations are comparable to the length of a night, reducing the probability of observable transits occurring. Such targets would benefit from supplementary observations from space-based observatories, as these do not suffer from either atmospheric distortion or limits on observing time due to Earth's diurnal cycle.