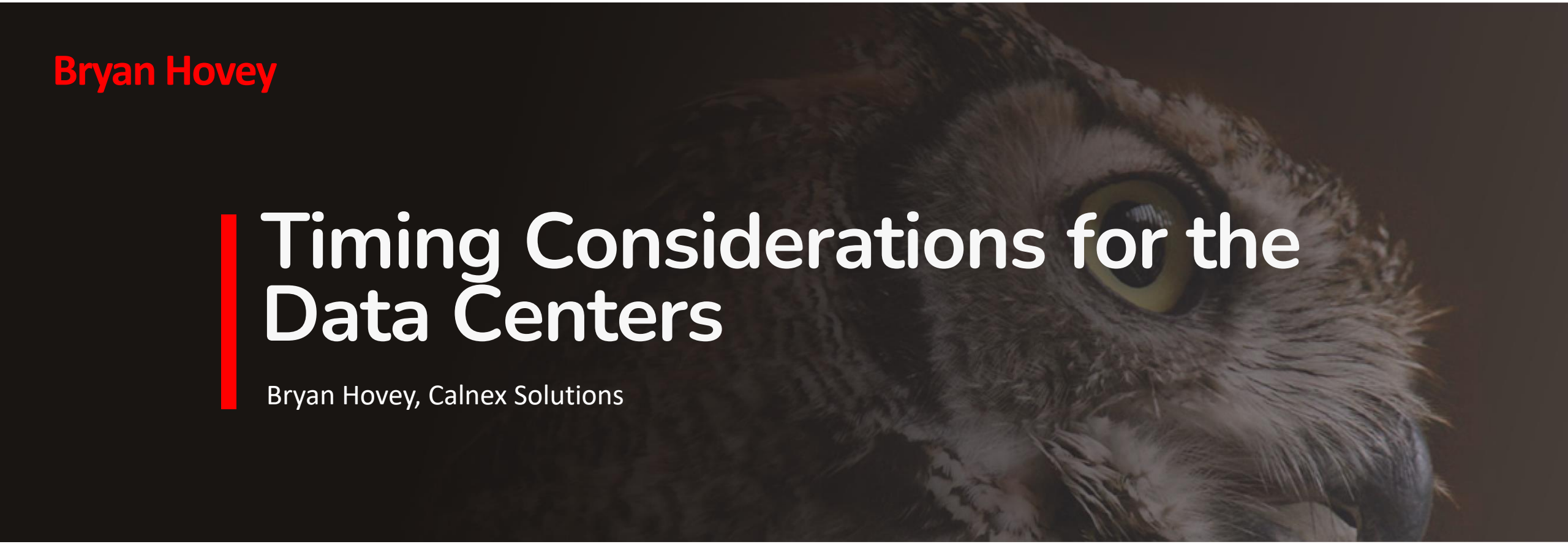
Bryan Hovey



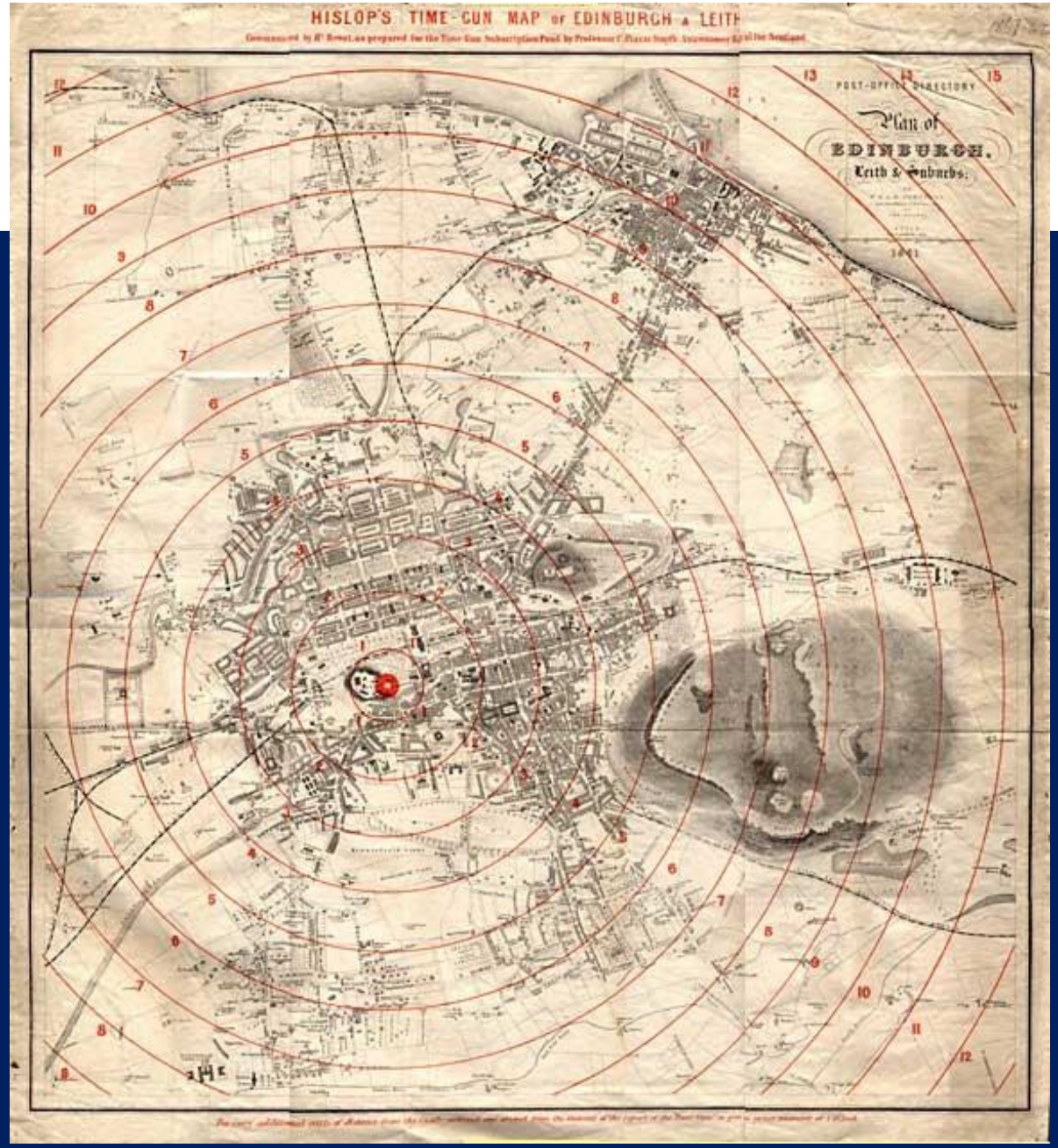
Timing Considerations for the Data Centers

Bryan Hovey, Calnex Solutions

19th Century Time Synchronisation – 1PPD

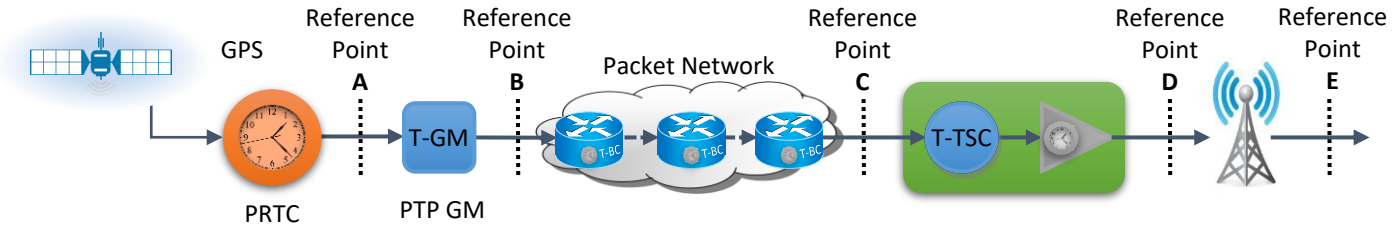
19th Century Delay Correction

12 Second Delay to User
±1.5% delay variation for temperature

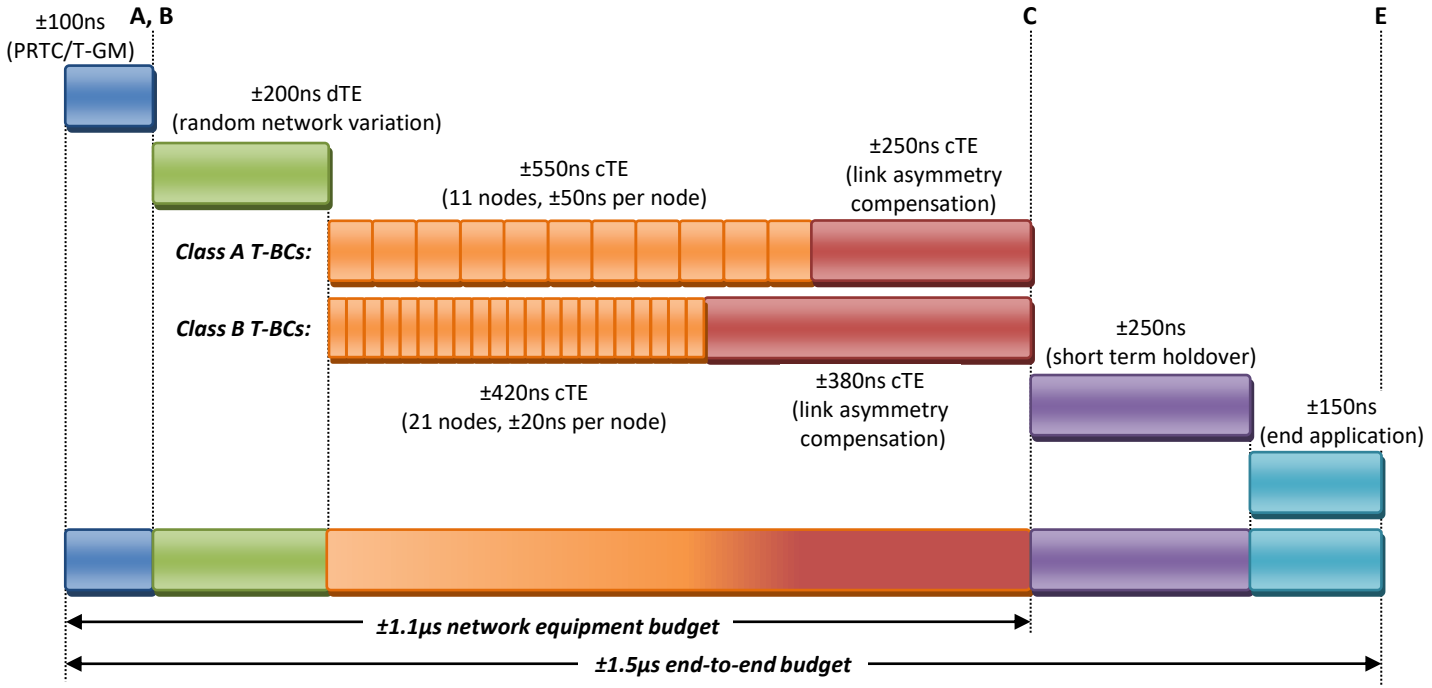


Precision Time in Data Centers

What's the big deal?

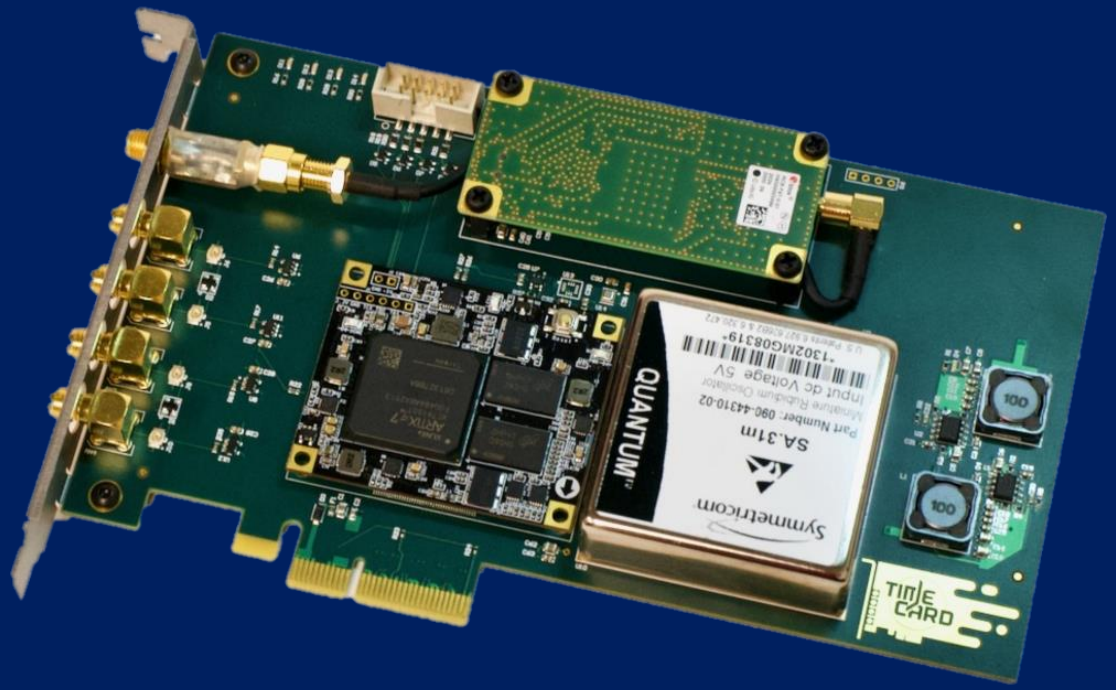


G.8271.1 Network Reference Points



Data center challenges with GMs

- Must be secure. Security fixes must be quick
- Should be easily configured and monitored
- Ideally user serviceable
- Cost



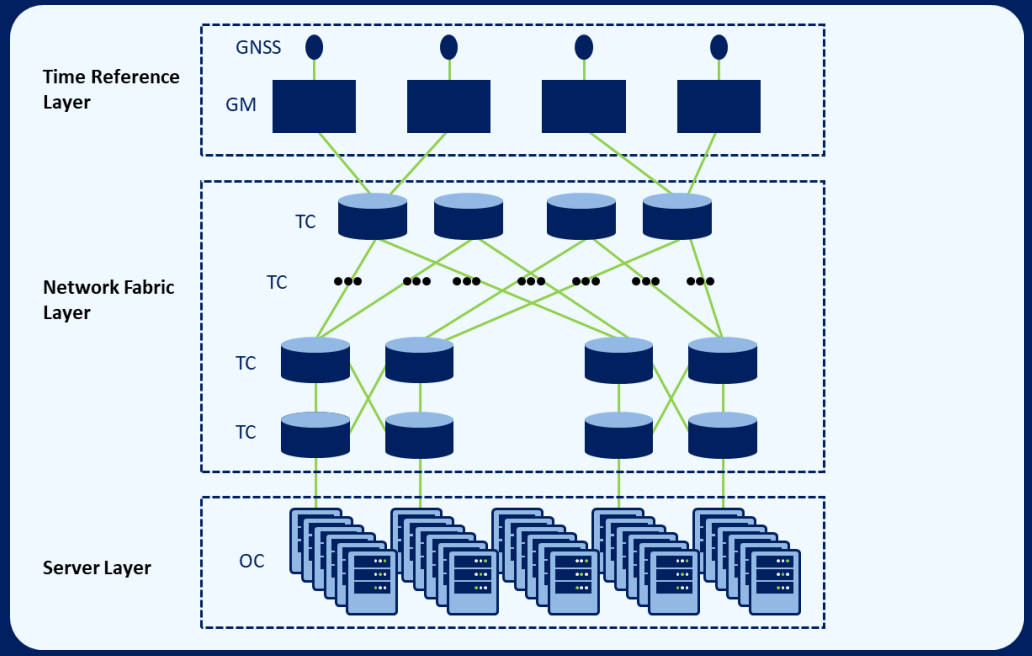
Source: Engineering at Meta, ‘Open-sourcing a more precise time appliance’ 11 Aug 2021

GNSS as a source of UTC

Easily available but vulnerable

Datacenter PTP Profile No.1 - OCP

Figure 1.
Model 1 – Chain of Transparent Clocks



From Datacenter PTP Profile No. 1 Model 1 (OCP):

- The maximum time error between any two OCs must be within ± 5 µs
- The maximum time error between a GM and any OCs must be within ± 2.5 µs
- The maximum time error generated by a TC must be within ± 100 ns
- Etc.

Source: OCP

Trade-offs of Boundary clocks vs Transparent Clocks

Boundary Clock

+ Scalable

+ Reduced workload on GM

+ Opportunity to future proof network

- Less tolerant of heterogenous environment

- Greater workload to manage at scale

Transparent Clock

+ More tolerant of heterogenous environment. Can be partially deployed

+ Easier to manage at scale

+ Less expensive oscillators

- Less expensive oscillators

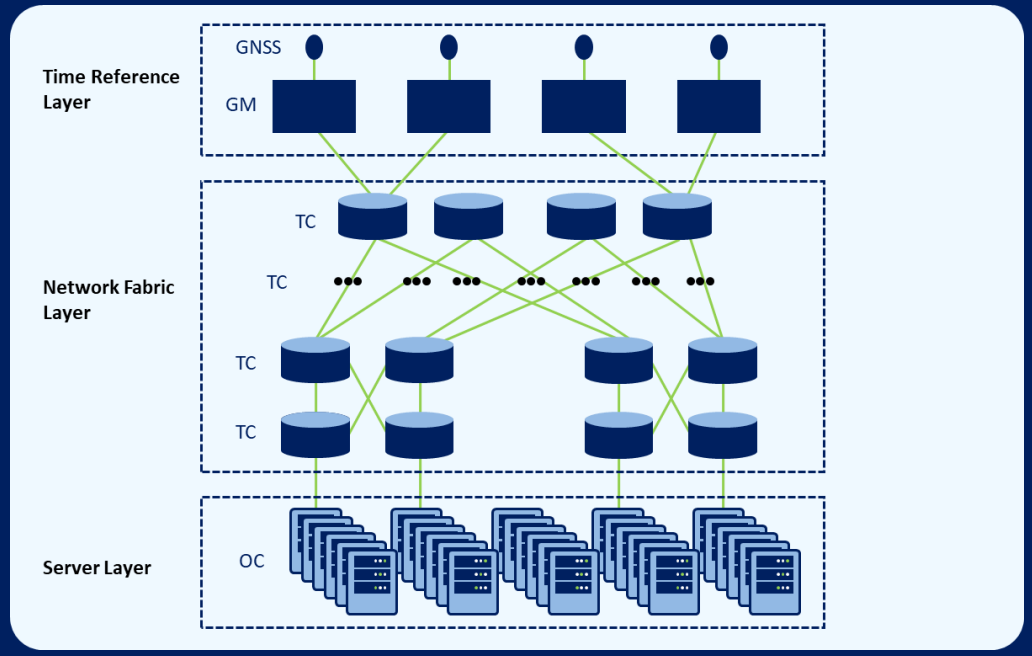
- Less scalable requiring GM to support all streams

- No recovered time

Another view on the selection of TCs

Datacenter PTP Profile No.1 – OCP

Figure 1.
Model 1 – Chain of Transparent Clocks



- Allows staged deployment on existing network
- Potentially allows staged improvement with BCs

Source: OCP

Calnex Solutions

Bryan Hovey

bryan.hovey@calnexsol.com

Insight and Innovation