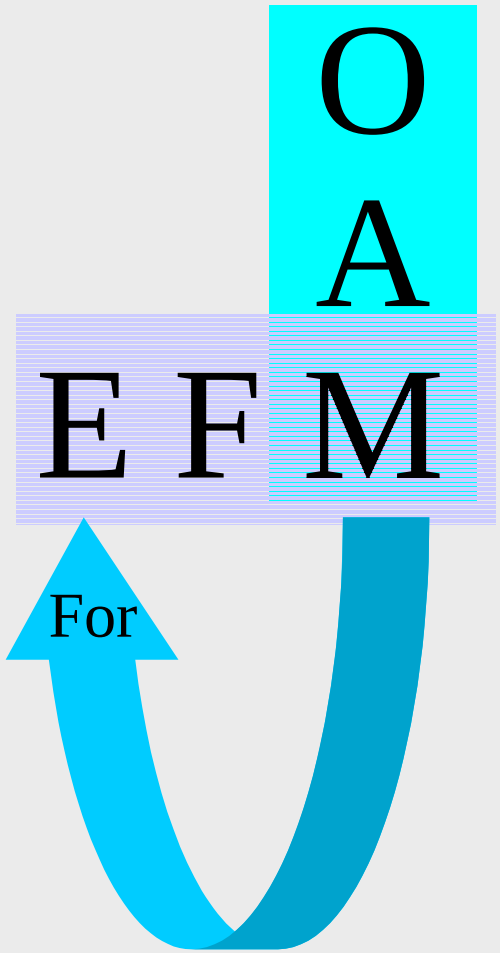


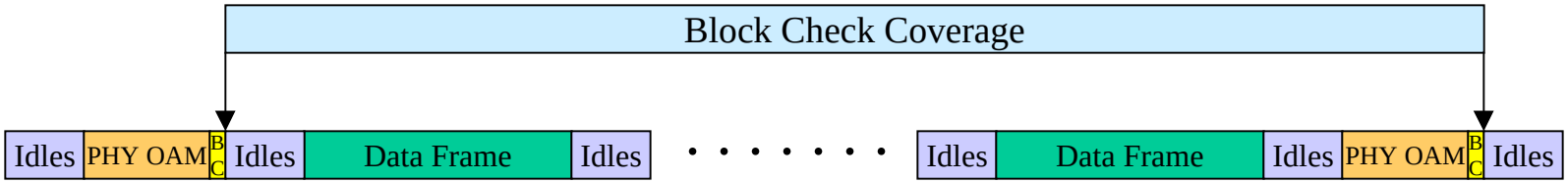
PHY OAM Link Monitoring

George Claseman
Micrel - Kendin Operations

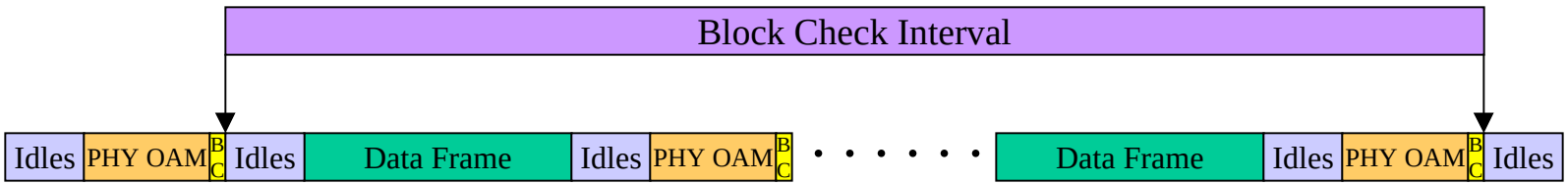
Link Level Error Monitoring

- Used as a low level line integrity check independent of the data service
- Needed for links that connect to physical layer only devices
- Needed for links that are comprised of multiple pairs to isolate single pair errors
- Used for line integrity check on backup redundant links not in service
- Can have independent error levels on a per link basis
- Only causes an indication when an error threshold level is crossed

Block Check Overview

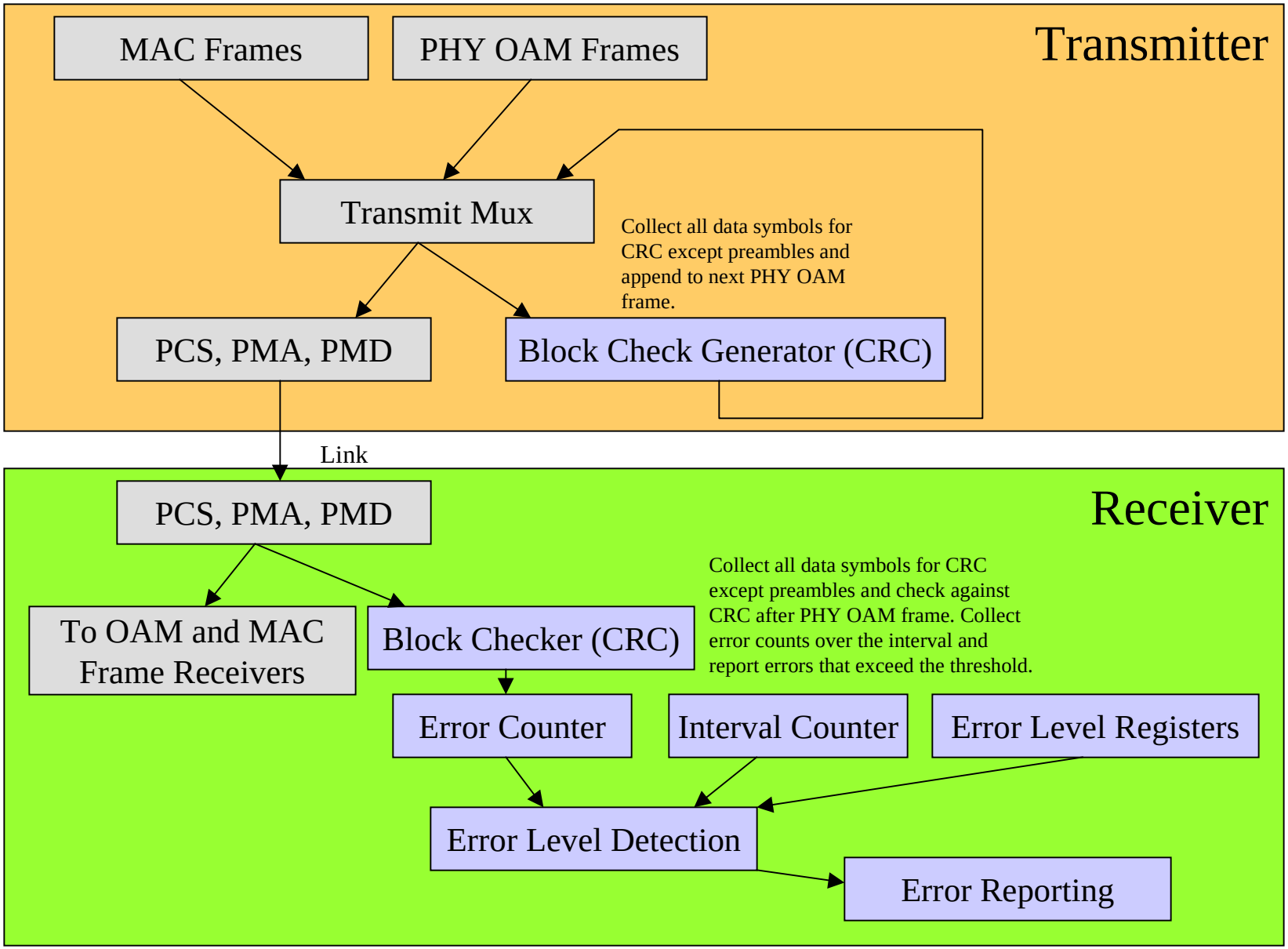


- Block check includes all data symbols (excluding control, IPG and preamble bytes)
- Block check is generated on the transmission side of the link and checked on the receive side of the link

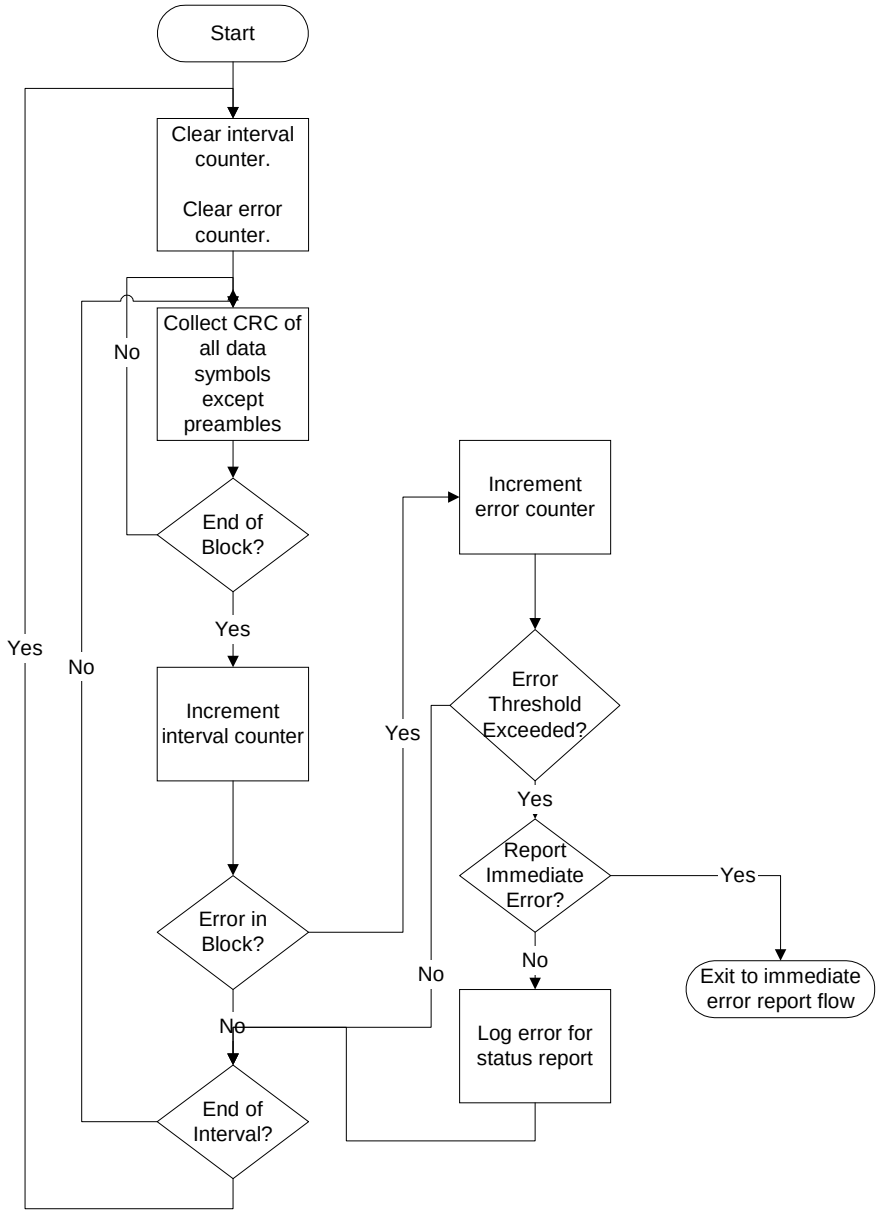


- The Block Check Interval includes a variable amount of Block Checks
- Error counts are accumulated during the Block Check Interval and cleared at the interval boundary
- If Error counts exceed the specified threshold, a link error is reported
- Additional warning thresholds can be established if desired
- On Error counts over the threshold, there is an option to switch to a redundant path

Operation Over a Single Link (single direction illustrated)



Error Checking Using Interval Count and Error Threshold

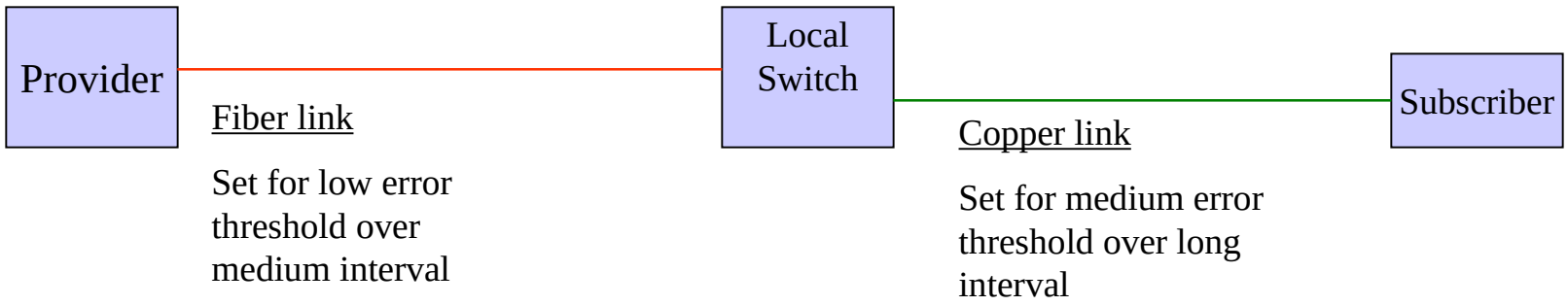


- Interval counter and error thresholds are managed objects set by the provider
- Errors are collected over the interval
- Non-immediate errors are reported as status
- Part of a fatal error flow could include redundant path switching
- Error reporting could be done through PHY OAM or alternate means
- Provisions could be made for fatal and warning error levels

Multi-link Interval and Error Level Example #1

PHY OAM Cadence

Set to standard telephony cadence (125us) or alternate rate



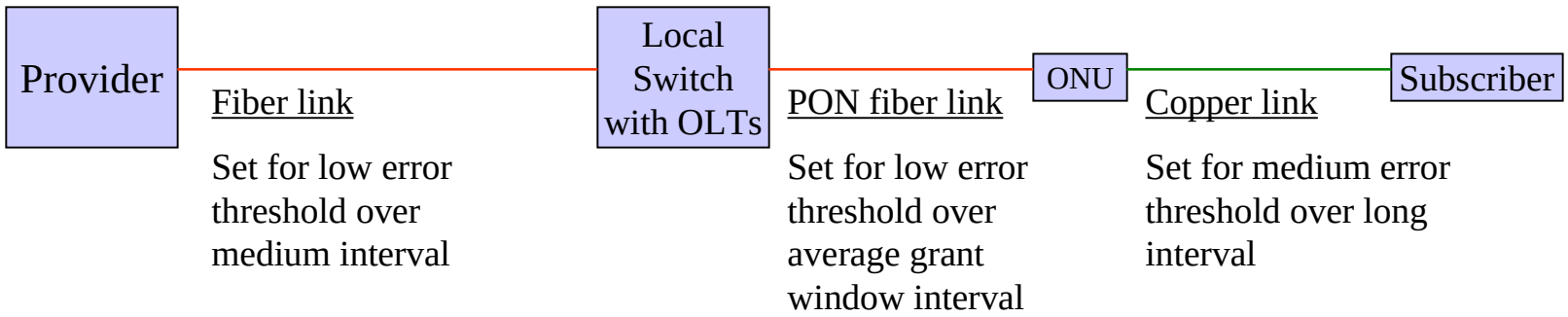
- Fiber links can have low BER parameters that can be adjusted based on the fiber plant and budget
- Copper links with higher BER expectations can be adjusted for higher error thresholds, but average errors over a longer period

Copper
Fiber

Multi-link Interval and Error Level Example #2

PHY OAM Cadence

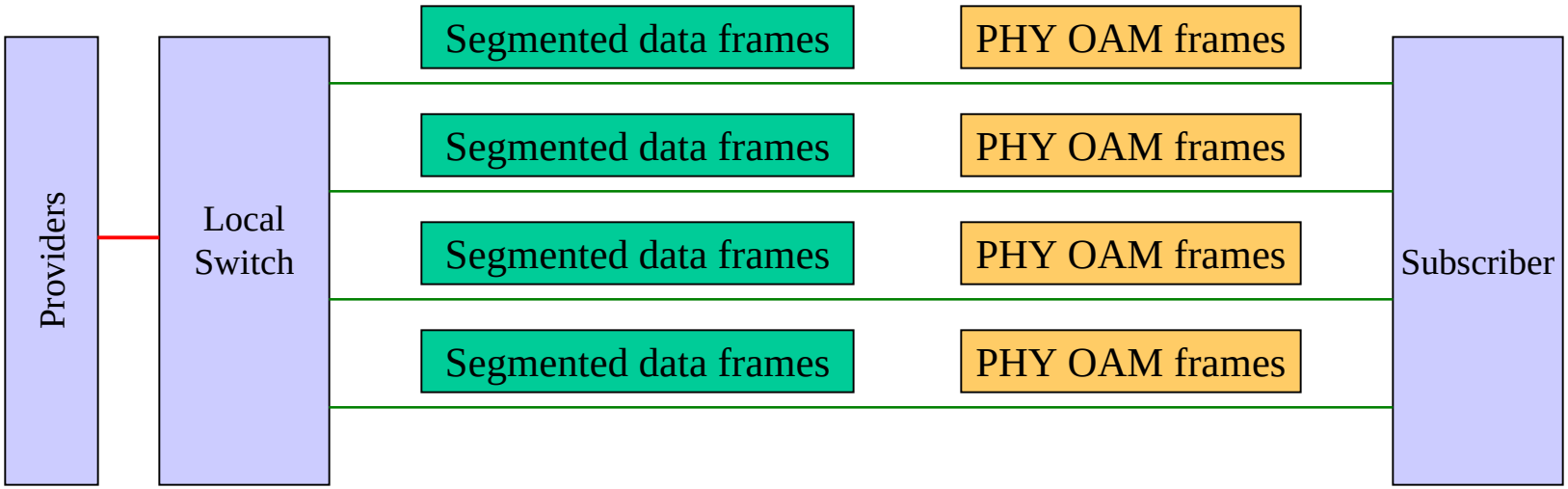
Set to standard telephony cadence (125us) or alternate rate



- Fiber links can have low BER parameters that can be adjusted based on the fiber plant and budget
- PON links can have intervals sized closer to ONU timeslots and error thresholds based on fiber plant
- Copper links with higher BER expectations can be adjusted for higher error thresholds, but average errors over a longer period

Copper
Fiber

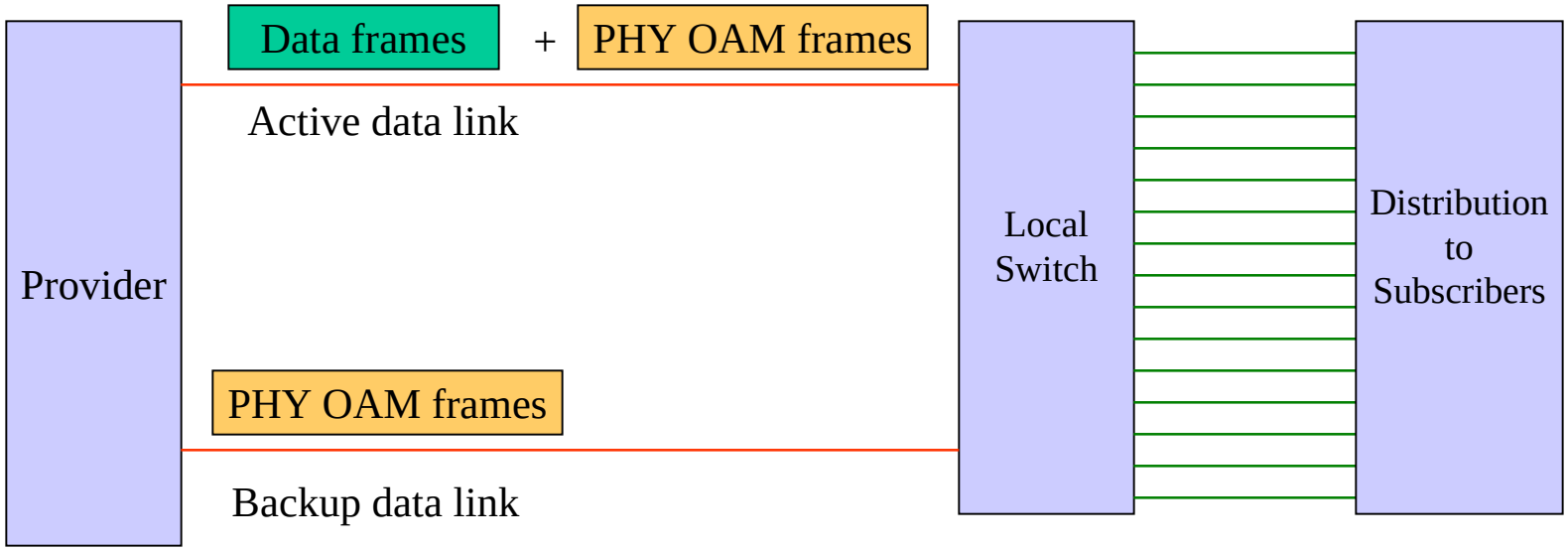
Error Checking Over Aggregated Links (e.g. bonded DSL)



- PHY OAM frame block checks provide integrity checks on a per link basis for multi-link connections
- Block checks run independent of segmenting engine and are only concerned with data symbols allowing flexibility in data transport
- Errors are reported on a per link basis for fault isolation
- Block error checking augments MAC statistics and improves error isolation

Copper
Fiber

Error Checking Over Idle Redundant Links



- PHY OAM frames run continuously over backup links
- This provides error checking when there is no data flowing over the link
- Pings and loop backs complete the capabilities for offline testing and integrity assurance

Copper
Fiber

Summary

- The PHY OAM Block Check allows for direct link integrity checking
- Each individual link can have its own interval and error threshold parameters
- Block checking allows for monitoring and diagnosing aggregated or bonded links
- Works in conjunction with MAC statistics to determine the overall health of a link
- Provides a flexible frame independent method of error checking