

The logo for the 2010 PASS Summit is a stylized, multi-colored shield shape with a blue and orange border. Inside the shield, the text "2010" is in orange, "PASS" is in large red letters, and "SUMMIT" is in smaller red letters below it. The background of the shield features a colorful, abstract pattern of lines and shapes.

2010
PASS
SUMMIT

November 8 - 11, Seattle, WA
www.sqlpass.org/na2010



Deadlock Detection, Troubleshooting, and Prevention

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Deadlocks are like ants...





Contact Information



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Agenda

- Deadlocking basics
- Detecting deadlocks
- Troubleshooting deadlocks
- Preventing deadlocks





Deadlocking Basics



What is a deadlock?

Demonstration



Deliberately causing a deadlock



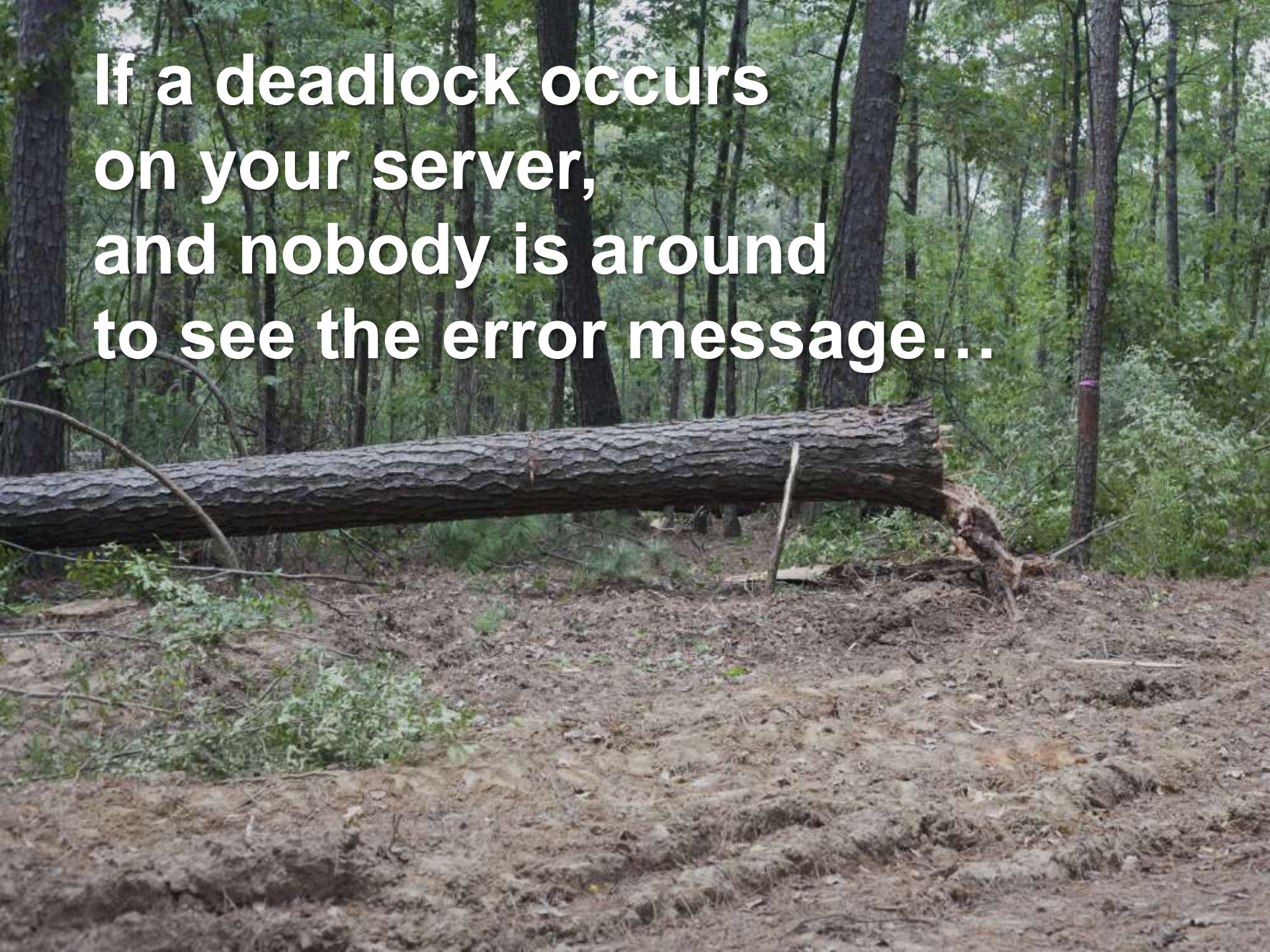
Deadlock Detection

Error message 1205

Msg 1205, Level 13, State 51, Line 1
Transaction (Process ID 52) was
deadlocked on lock resources with
another process and has been chosen as
the deadlock victim. Rerun the
transaction.



**If a deadlock occurs
on your server,
and nobody is around
to see the error message...**



Error message suppression

```
private void associateSchedule
(
    int scheduleID,
    int userID
)
{
    using
    (
        SqlConnection connection = new SqlConnection(Application["ConnectionString"])
    )
    {
        using
        (
            SqlCommand command = new SqlCommand
            (
                "[Scheduler].[AssociateSchedule]",
                connection
            )
        )
        {
            try
            {
                command.Parameters.Add("@ScheduleID", SqlDbType.Int).Value = scheduleID;
                command.Parameters.Add("@UserID", SqlDbType.Int).Value = userID;
                connection.Open();
                command.ExecuteNonQuery();
            }
            catch (SqlException exception)
            {
                redirectToFriendlyErrorPage(exception);
            }
        }
    }

    return;
}
```



Demonstration



Configuring 1205 errors to be logged



Deadlock Troubleshooting

Read Bart Duncan's blog posts!

1. "[Deadlock Troubleshooting, Part 1](#)"
 - "[Interpreting Trace Flag 1204 Output](#)"
2. "[Deadlock Troubleshooting, Part 2](#)"
3. "[Deadlock Troubleshooting, Part 3](#)"



Troubleshooting overview

1. Capture diagnostic data
2. Identify:
 - the ***parties*** to the deadlock and
 - the ***resources*** under contention
3. Take corrective action



Demonstration



Diagnostics – SQL Server 2000 (or earlier)

Demonstration



Diagnostics – Trace flag 1222

Demonstration



Diagnostics – Deadlock Graph event class

Demonstration



Diagnostics – Deadlock Graphs and XQuery

A warning about XQuery



Demonstration



Diagnostics – Extended Events

Cheat!

1. Use the Database Engine Tuning Advisor
2. Ask for help



Demonstration



Setting the deadlock priority

Fault-retry logic

The following example is taken directly from *Inside Microsoft SQL Server 2005: Query Tuning and Optimization* by Kalen Delaney (found on pages 365 and 366).

```
DECLARE @Tries tinyint, @Error int;
SET @Tries = 1;
WHILE @Tries <= 3
BEGIN
    BEGIN TRANSACTION;
    BEGIN TRY
        -- <code goes here>
        IF XACT_STATE() = 1 COMMIT;
        BREAK;
    END TRY
    BEGIN CATCH
        SET @Error = ERROR_NUMBER();
        IF @Error = 1205
        BEGIN
            IF XACT_STATE() = -1 ROLLBACK;
        END
        SET @Tries = @Tries + 1;
        CONTINUE;
    END CATCH;
END;
```





Deadlock Prevention



- Access tables consistently



- Keep transactions short



- Add useful indexes



- Avoid user interaction within transactions



- Reschedule batch processes



- Adjust locking strategy



- Use bound connections



- Access tables consistently

Procedure 1

[Sales].[Orders]

[Sales].[OrderHeaders]

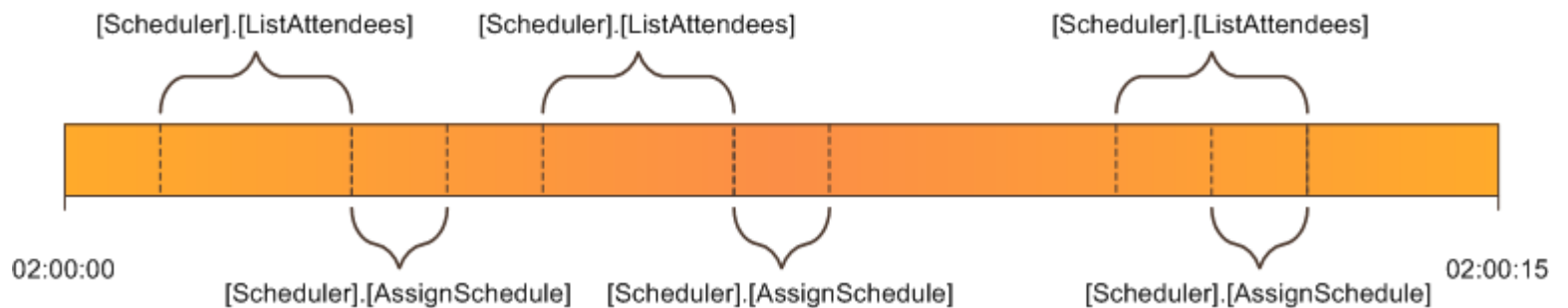
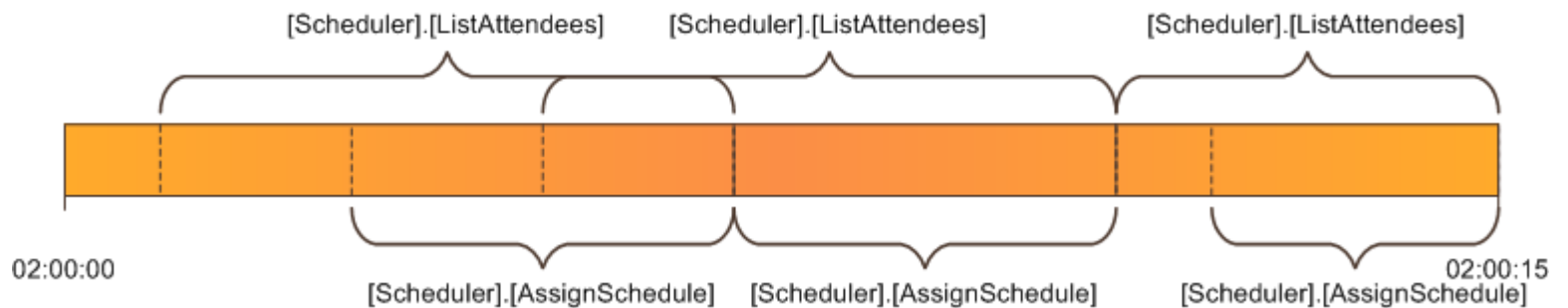
Procedure 2

[Sales].[OrderHeaders]

[Sales].[Orders]

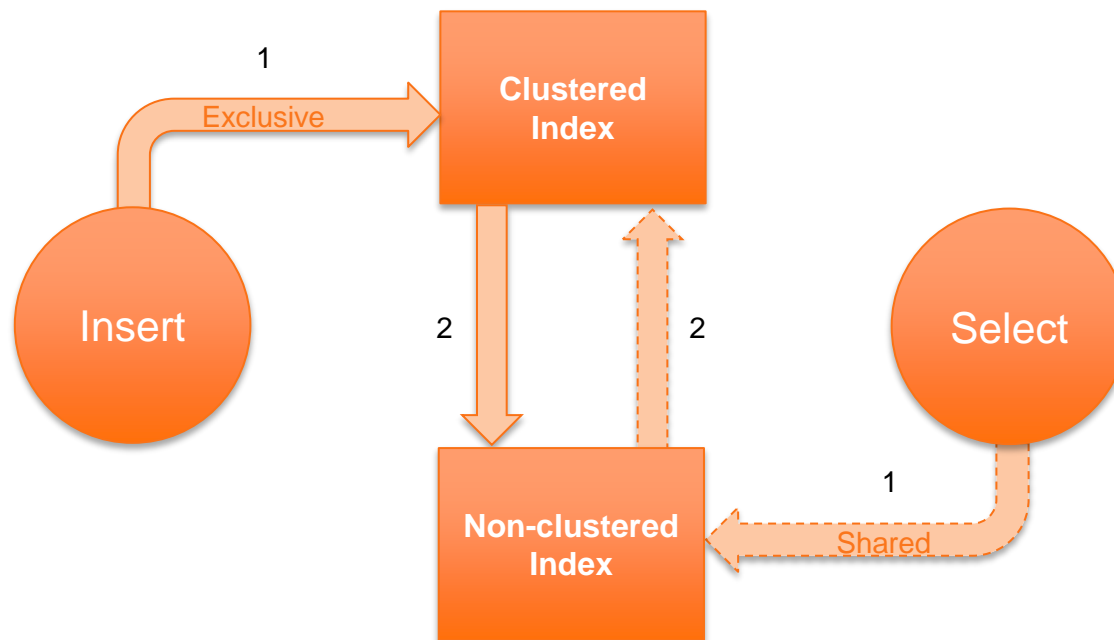


- Keep transactions short



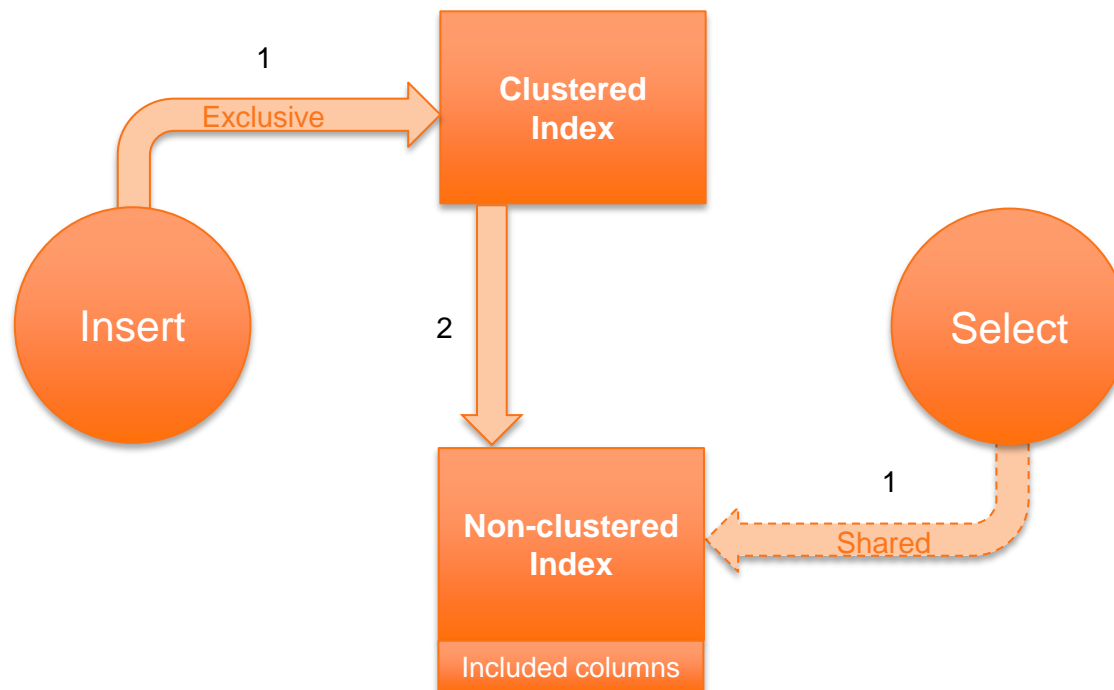
Before...

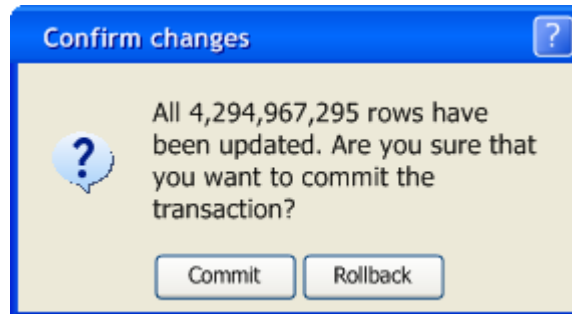
- Add useful indexes



After...

- Add useful indexes






- Avoid user interaction within transactions






- Reschedule batch processes



- 
- Consider restrictive locking up-front
 - Evaluate row-versioning isolation levels
 - **Carefully** explore reducing isolation levels or using locking hints

- Adjust locking strategy

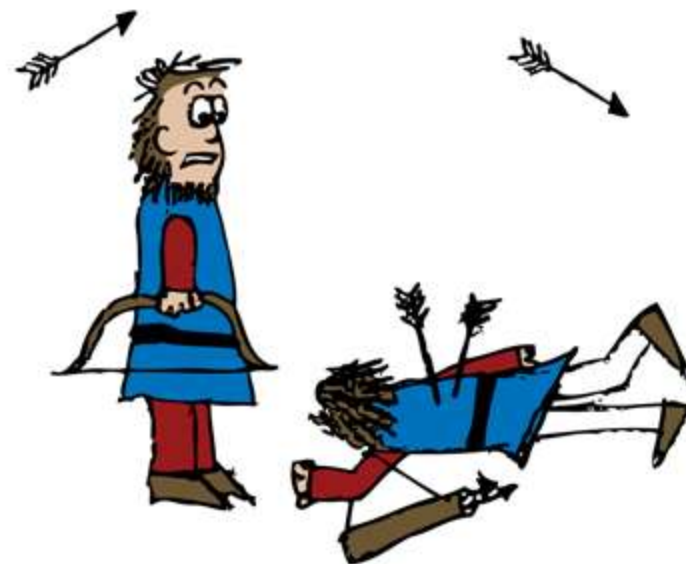
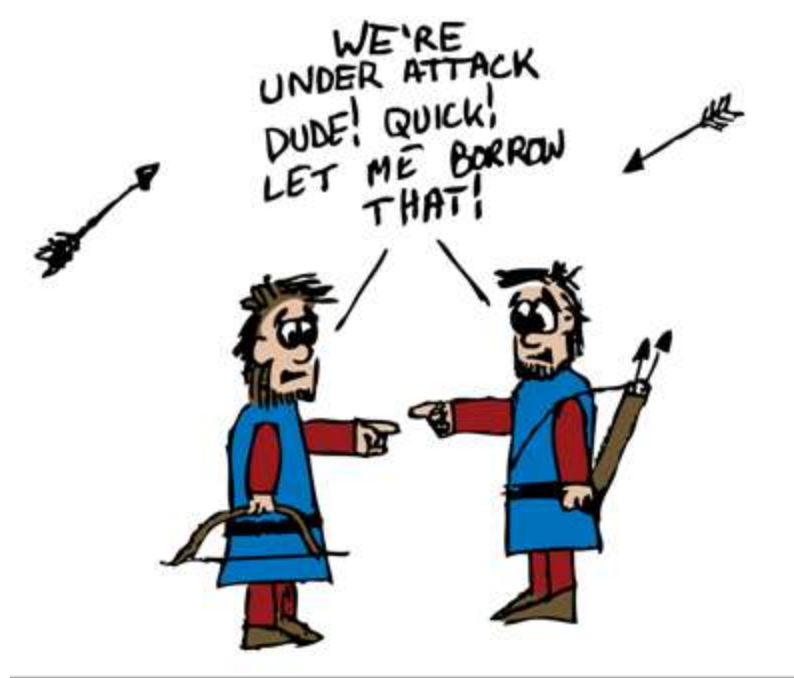




If using Multiple Active Result Sets (MARS),
consider using “bound connections” to allow
resource sharing

- Use bound connections





Deadlock Victim

Prescriptive Guidance – Proactive

1. Modify error message 1205 to be logged
2. Add fault-retry logic to applications
3. Establish protocols for table access
4. Use explicit transactions, and never include user-interaction within them
5. Stagger batch/scheduled processes



Prescriptive Guidance – Reactive

1. Capture deadlock diagnostic data:
 - Trace Flag 1204 (SQL Server 2000)
 - Deadlock Graph event class (SQL Server 2005+)
2. Identify deadlocked processes and resources
3. Set deadlock priorities
4. Run the Database Engine Tuning Advisor
5. Consult with other DBAs



Contact Information



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Thank you

for attending this session and the
2010 PASS Summit in Seattle